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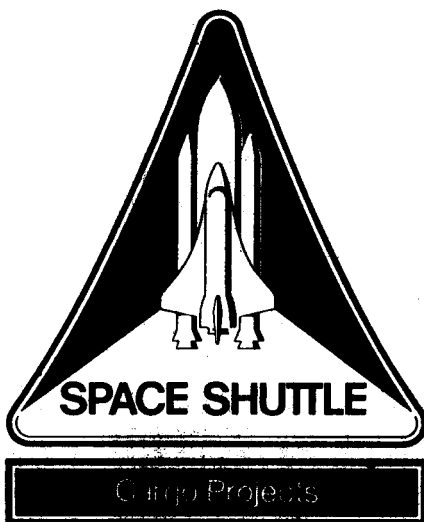
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Facilities Handbook For Life Science Support Facility - Hangar L



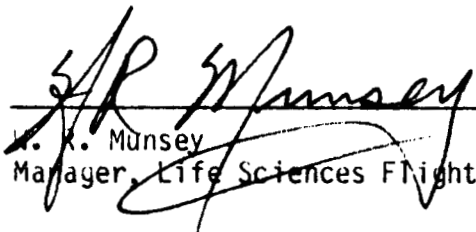
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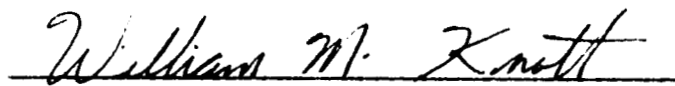
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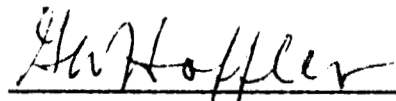
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FACILITIES HANDBOOK
FOR
LIFE SCIENCE SUPPORT FACILITY (LSSF) -
HANGAR L

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ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this handbook. Complete listings of STS and associated payloads glossary, acronyms, and abbreviations are contained in KSC document GP-1052 and NASA Reference Publication 1059.

A	ampere
AC, ac	alternating current
AHR	animal holding room
ARC	Joseph S. Ames Research Center
ASME	American Society of Mechanical Engineers
BLDG.	building
CCAFS	Cape Canaveral Air Force Station
CEM	cement
cm	centimeter
CMU	concrete masonry unit
COMM	communication
Conduct.	conductive
CONF.	conference
Contam.	contaminated
Cont.	control
DI	deionized
DK	dark
DSTF	Delta Spin Test Facility
Elasto.	elastomeric
ELEV	elevator
EMERG, emerg.	emergency
EQUIP, Equip	equipment
ESA 60A	Explosive Safe Area 60A
ETO	ethylene oxide
fc	footcandle
ft	foot
gal	gallon
GENR	generator
Gnd	ground
GWB	gypsum wallboard
h	hour
HDQS	Headquarters Building (KSC)
HEPA	high efficiency particle air
Hg	mercury
HVAC	heating, ventilating, air-conditioning
Hz	hertz

ABBREVIATIONS AND ACRONYMS (Continued)

in	inch
IRIG	Interrange Instrumentation Group
JSC	Lyndon B. Johnson Space Center
kg	kilogram
KSC	John F. Kennedy Space Center
kVA	kilovolt ampere
kW	kilowatt
l	liter
lb	pound
LD	lead
LED	light-emitting diode
lm	lumen
LSFE	Life Sciences Flight Experiments (Program)
LSSF	Life Science Support Facility
LSSM	Launch Site Support Manager
m	meter
MECH, Mech	mechanical
min	minute
mm	millimeter
NASA	National Aeronautics and Space Administration
NDTL	Nondestructive Test Laboratory
No.	number
N-W	northwest
O&C	Operations and Checkout (Building)
OFF	office
OIS	Operational Intercommunication System
OPF	Orbiter Processing Facility
P	pole
PA	public address
PCN	project control number
PI	Principal Investigator
PLAS	plaster
POCC	Payload Operations Control Center
Proj	project
RD	road
REC	receiving
RH	relative humidity
RM, Rm	room
RSS	Rotating Service Structure
RTG	Radioisotope Thermoelectric Generator

ABBREVIATIONS AND ACRONYMS (Continued)

SAEF	Spacecraft Assembly and Encapsulation Facility
SHT	sheeting
SID	Standard Interface Document
SMAB	Solid Motor Assembly Building
STS	Space Transportation System
TBD	to be determined
TOPS	Transistorized Operations Paging System
V	volt
VAB	Vehicle Assembly Building
VIB	Vertical Integration Building
VAT	vinyl asbestos tile
vet.	veterinarian
VPF	Vertical Processing Facility
W	watt, wire
yd	yard
%	percent
°C	degree centigrade
°F	degree Fahrenheit
∅	phase

FOREWORD

Launch site payload processing facilities are described in three levels of documentation. These levels and their purposes are:

- a. K-STSM-14.1, Launch Site Accommodations Handbook for STS Payloads - This document provides a brief summary of each facility and John F. Kennedy Space Center (KSC) launch and landing site operations.
- b. Facilities Handbooks - Each handbook provides a narrative description of the facility and its systems. Also, general operating rules/regulations and safety systems are discussed in these handbooks. Handbooks available are:

K-STSM-14.1.1	Facilities Handbook for Building AE
K-STSM-14.1.2	Facilities Handbook for Building AO
K-STSM-14.1.3	Facilities Handbook for Building AM
K-STSM-14.1.4	Facilities Handbook for Hangar S
K-STSM-14.1.5	Facilities Handbook for Delta Spin Test Facility
K-STSM-14.1.6	Facilities Handbook for Explosive Safe Area 60A
K-STSM-14.1.7	Facilities Handbook for SAEF 2
K-STSM-14.1.8	Facilities Handbook for Radioisotope Thermoelectric Generator Storage Building
K-STSM-14.1.9	Facilities Handbook for Life Science Support Facility - Hangar L
K-STSM-14.1.10	*Payload Accommodations at the Rotating Service Structure
K-STSM-14.1.11	Facilities Handbook for Payload Ordnance Processing Area at CCAFS
K-STSM-14.1.12	Facilities Handbook for Vertical Processing Facility
K-STSM-14.1.13	*Orbiter Processing Facility Payload Processing and Support Capabilities
K-STSM-14.1.14	*Operations and Checkout Building Payload Processing and Support Capabilities

These facilities handbooks are not under configuration control; however, they will be reissued as necessary in order to maintain usefulness to STS users in their planning for launch site processing of their payloads.

* These handbooks are titled differently because the facilities serve functions other than payload support. The payload accommodations are emphasized in these documents.

- c. Standard Interface Documents (SIDs) - The SIDs provide the design-to interfaces for the following launch site payload processing facilities and equipment:

SID 79K12170	Payload Ground Transportation Canister
SID 79K16210	Vertical Processing Facility
SID 79K16211	Horizontal Processing Facility (O&C Building)
SID 79K17644	Payload Strongback
SID 79K18218	Launch Pad 39A
SID 79K18745	Orbiter Processing Facility (OPF)
SID 79K20954	Payload Environmental Transportation System (PETS) Multiuse Container
SID 79K24867	Hangar L - Life Science Support Facility

SIDs will not be available for some launch site payload processing facilities. In these cases, the facilities capabilities handbooks must be used for design-to-interface information. When SIDs are available, they should be used as the official definition of the facility interfaces. The SIDs for the launch site payload support equipment (strongback, canister, and PETS) have no accompanying facilities handbooks.

STS users may obtain copies of any of these documents through the Launch Site Support Manager assigned to the STS users' payloads.

SECTION I INTRODUCTION

1.1 PURPOSE

The purpose of this handbook is to provide basic information of the payload processing and support capabilities in the Life Science Support Facility (LSSF), Hangar L, on the Cape Canaveral Air Force Station (CCAFS). The building and location are shown in figure 1-1.

1.2 SCOPE

This handbook is intended to be used by the Space Transportation System (STS) users as a guide for the planning of nonhuman life science experiment support activities in the LSSF. It provides the general experiment/payload capabilities of the LSSF and expands the summary data in section IV of K-STSM-14.1, Launch Site Accommodations Handbook for STS Payloads. The detailed facility interfaces are contained in 79K24867, Standard Interface Document (SID), Hangar L - Life Science Support Facility.

1.3 ORGANIZATION

The material presented in this document is organized as follows:

<u>Section</u>	<u>Title</u>
II	Facility Description
III	Mechanical Systems
IV	Electrical Systems
V	Communications and Data Handling
VI	Facility Description Summary
Appendix A	LSSF General Equipment
Appendix B	Biospecimen Transport Van

1.4 USER CHARGE

Use of the LSSF for support of nonhuman life science payloads is considered an optional service. LSSF use is charged as off-line laboratory support. Use of supplies and special support, such as analytical services, is charged as an optional service to non-Life Science Flight Experiment (LSFE) personnel/payloads. See K-STSM-14.1, section X, and K-CM-16.1, Payload-related Optional Launch Site Services Guide, for information about these charges.



1.5 FACILITY ACCOMMODATIONS

The facility accommodations available to the user as identified herein provide support to all payload elements of the mission manifest and to other payload elements being processed simultaneously. The user must remain cognizant during his design development of the necessity to share these facilities with other payload elements. The Principal Investigator (PI) and Experiment Developer should coordinate their requirements closely with the John F. Kennedy Space Center (KSC) LSSF Manager to assure that support is available when needed.

1.6 APPLICABLE DOCUMENTS

Other publications that provide additional information and detailed data regarding the LSSF are:

<u>Document Number</u>	<u>Title</u>
a. TBD	KSC LSSF Users' Guide
b. TBD	KSC LSSF Animal Care Management Plan
c. K-CM-16.1	Payload-related Optional Launch Site Services Guide
d. K-SLM-09.2	Life Science Support Facility Operations Plan
e. K-STSM-14.1	Launch Site Accommodations Handbook for STS Payloads
f. 79K18550	Modifications for Life Science PI Support Facility
g. 79K18551	Modifications for Life Science Support Facility (LSSF), CCAFS
h. 79K21370	CCAFS Industrial Area, Hangar L, South Lean-To Modifications
i. 79K21967	LSSF Data Control Room, Hangar L, CCAFS Industrial Area
j. 79K24777	Procurement Specification, Life Sciences Flight Experiments (LSFE) Transportation Van for Biospecimens
k. 79K24867	Standard Interface Document, Hangar L Life Science Support Facility

SECTION II FACILITY DESCRIPTION

2.1 GENERAL

Hangar L is located on Hangar Road in the CCAFS Industrial Area (see figure 2-1) and is the nonhuman Life Science Support Facility (LSSF) for the STS.

This concrete block and steel frame hangar with two-story structures connected at the north and south sides has overall dimensions of approximately 170 ft by 184 ft (51.8 m by 56.1 m). A paved parking area surrounds the building, and the entire area is fenced. Figure 2-2 shows the building from the east side. Use of this building can be scheduled through the payload LSSM by the Facility Manager.

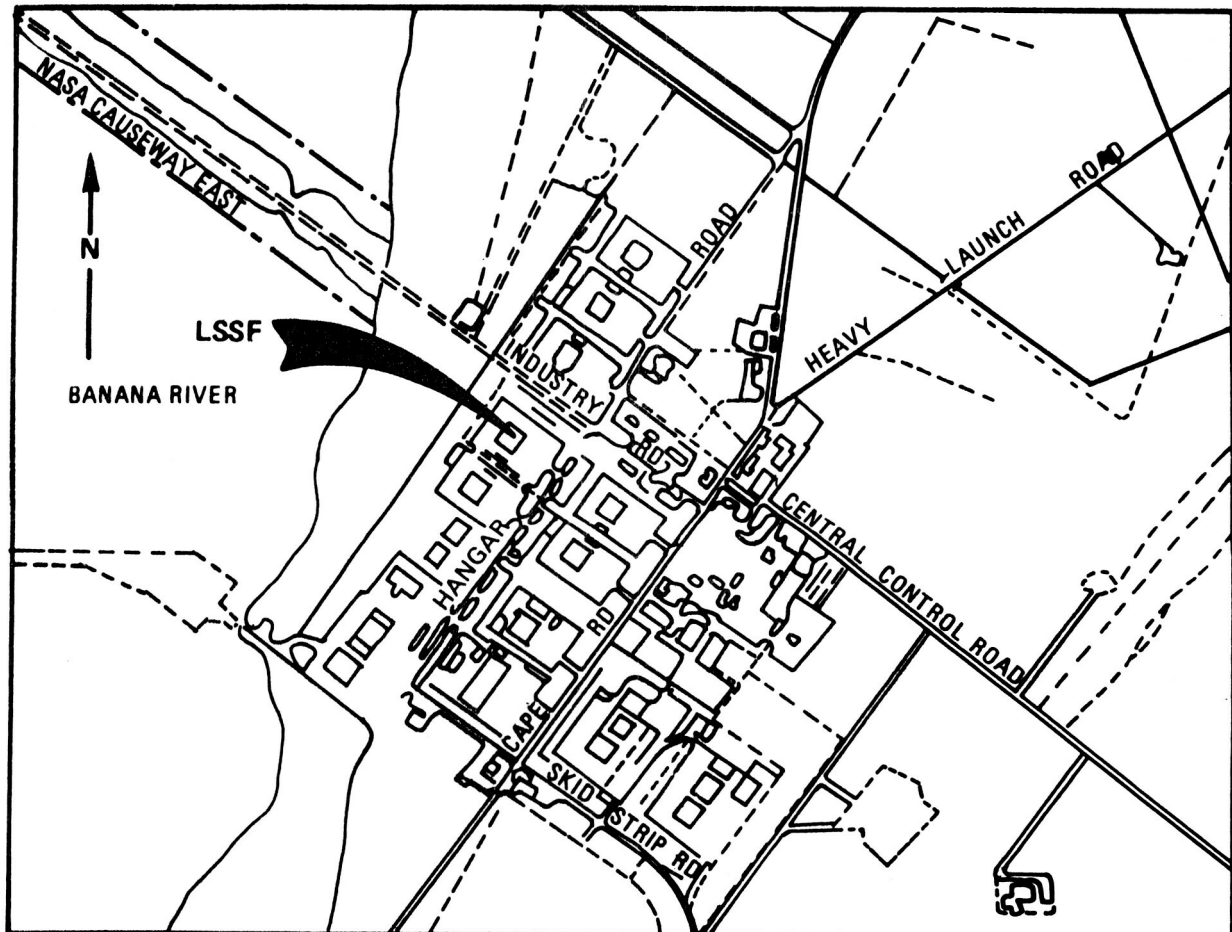


Figure 2-1. LSSF Location on CCAFS

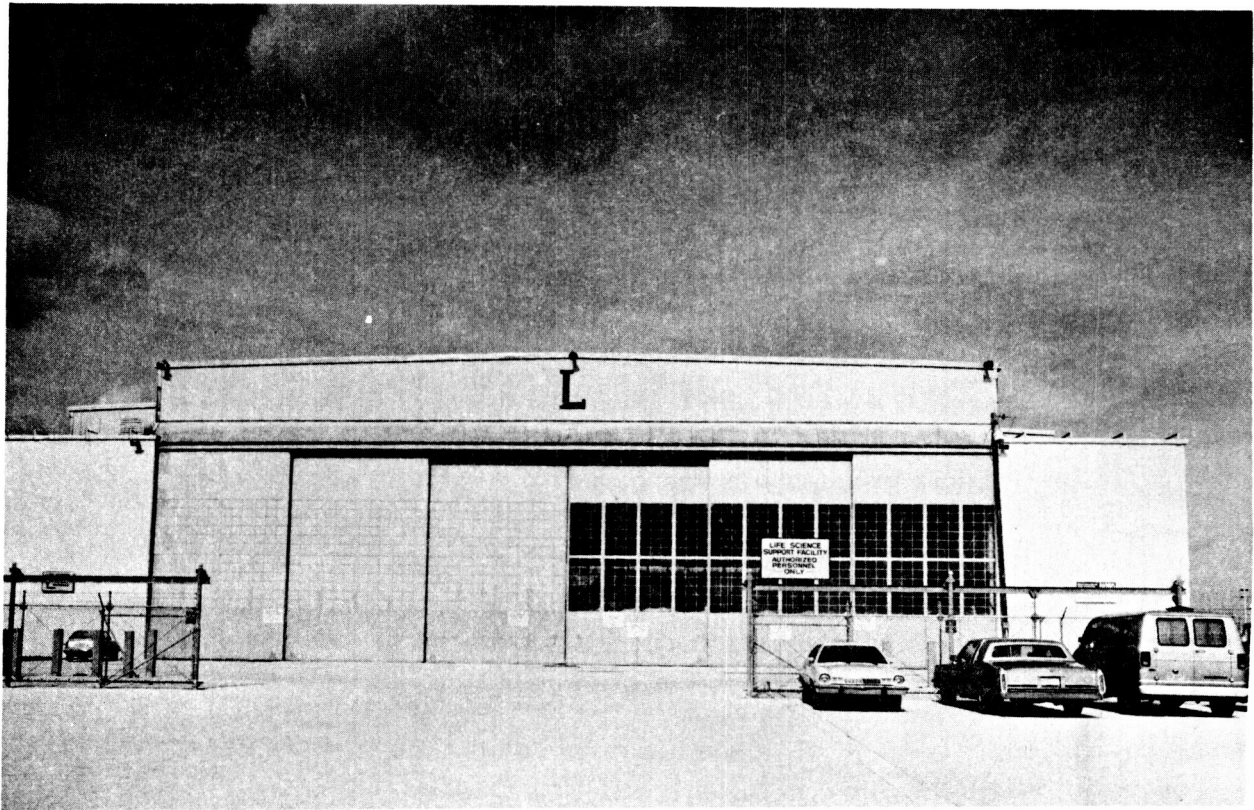


Figure 2-2. LSSF, Hangar L on CCAFS, from the East

2.2 FUNCTIONS

The LSSF supports nonhuman LSFs for the STS Program, accommodating primarily one dedicated payload containing 20 to 45 experiments in an 18-month period. This building will support PIs with capabilities for receiving and housing animals; receiving and storing of animal food supplies; cleaning, sanitizing, and storing cages and equipment; collecting and disposing of waste; supervision and administration; laboratory support; hygiene facilities for personnel; and flight animal isolation.

Specimen holding is available for small mammals, fish, amphibians, and plants. Laboratories are suitable for handling these specimens, cells, tissues, and micro-organisms. The LSSF also contains areas for surgery and x-ray, data management, storage, and synchronous ground control, as well as providing additional expansion capabilities for overlapping mission support.

2.3 ACCESS

Personnel and vehicles enter the LSSF fenced area through a gate on the east side, shown in figure 2-2. Access to the facility is restricted to authorized personnel, with security controls enforced. Access is also controlled within the LSSF to isolate the flight specimens.

The large hangar-type doors on the east and west sides remain closed and are opened only during loading/offloading of equipment and during maintenance checks.

2.3.1 PERSONNEL ACCESS. Personnel enter the facility through the main south entrance (figure 2-3) into the office area. Personnel check is performed in the lobby. Access to the laboratory and animal holding area is additionally controlled. Figure 2-4 provides a layout of the LSSF first floor, showing the south lobby entrance and the entrance to the laboratory area next to the elevator.

2.3.2 EQUIPMENT ACCESS. Equipment such as control experiment equipment enters through the west (back) door in the area marked for unloading. Small, hand-held equipment may be brought in through the personnel entrance on the south side.

2.3.3 ANIMAL/SPECIMEN ACCESS. Animals are brought in the front east entrance through either the hangar-type door or the small access door and taken to an animal holding room (AHR) for a period of stabilization. All animals will undergo a health inspection before being brought into the LSSF. Paperwork on the animal(s) must precede the animal(s) to room 163, office/receiving.

The animals are stabilized following transportation to the LSSF in the positive pressure airflow systems in the AHR. They remain in the AHR until the period of stabilization and monitoring is over; they are then placed in the appropriate AHR for flight preparation and eventual selection. Ground control selected animals will be placed in the ground control lab.

Plants, cultures, seeds, and support supplies can be brought into the facility through the east door(s) and taken by elevator to the second floor, north side Plant Lab (room 225N); room 209, Tissue Lab; or room 210, Growth Chamber Lab.

2.4 SECURITY

The LSSF is a controlled access facility. Individual areas are locked at all times and cannot be opened without a key. The AHR doors must be opened from both inside and outside with a key to prevent the inadvertent escape of an animal. All laboratories are kept locked, also. Security control details will be provided in the LSSF Animal Care Management Plan. Generally, the investigators assigned a laboratory are responsible for the security/access to that lab. The Facility Manager is responsible for controlling the access to the overall facility.

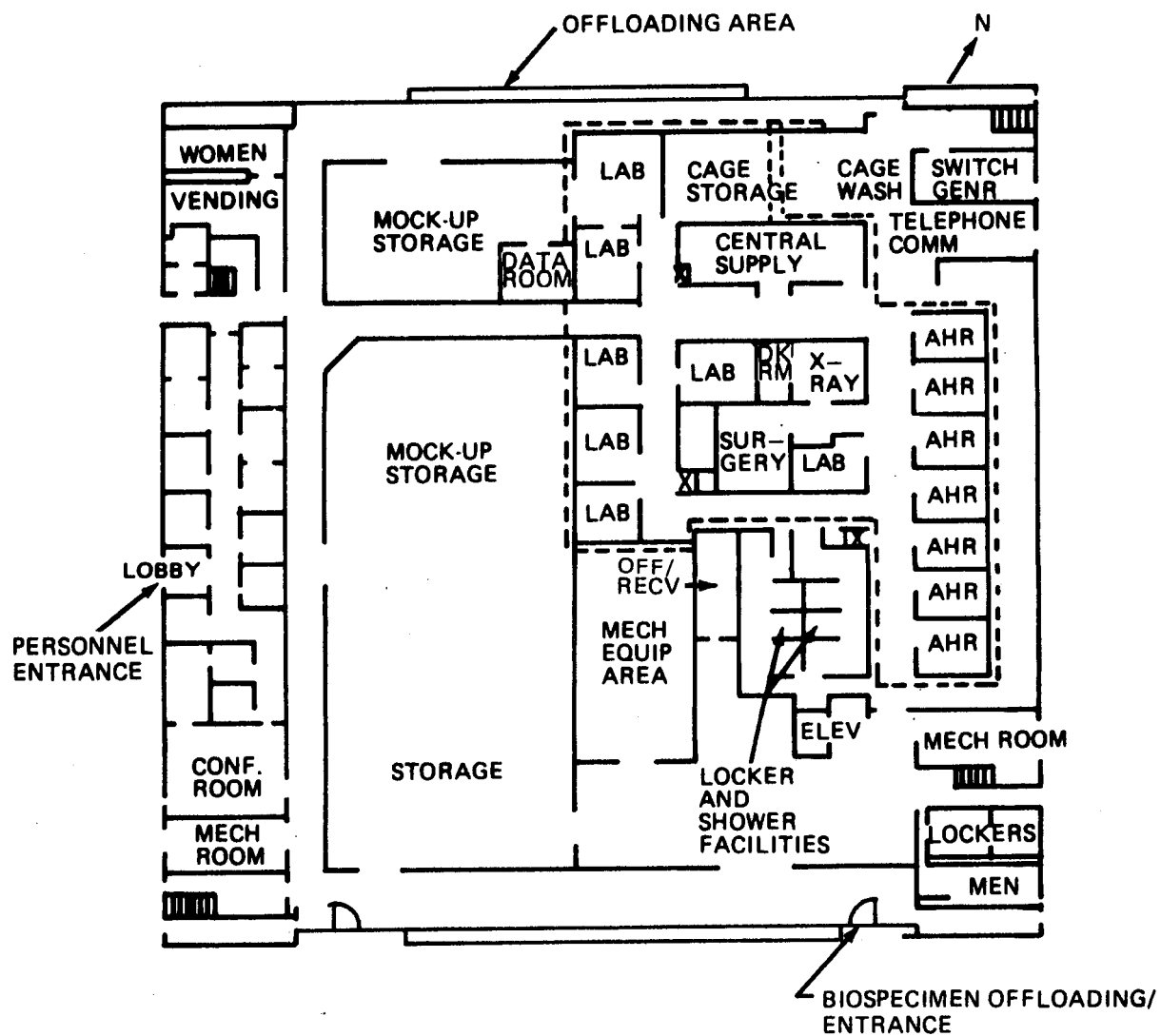


Figure 2-4. LSSF First Floor Layout

SECTION III MECHANICAL SYSTEMS

3.1 GENERAL

Facility construction is primarily rigid metal frame and concrete masonry block. First floor interior partitions are predominantly metal studs and lath and concrete block (where existing) covered with cement plaster. Second floor room partitions are constructed of metal studding covered with gypsum wall-board. External doors are metal and glass (hangar-type on east and west) as are the AHR doors; metal (all laboratory, special support rooms on first floor, and second floor north side doors); and wood (office areas). A steel rollup door leads from the cage wash area out to the incinerator.

The first floor of the north structure (northeast side of building) contains seven AHRs and a clean and contaminated corridor. The second floor of the north side contains a plant holding area, a plant lab, a tissue lab, a computer room, and a bonded storage area. The northern half of the central high bay contains laboratories, surgery/x-ray complex, central supply area, shower/locker rooms, office/receiving area, cage wash and storage areas, and a data control room. The southern half of the central high bay is basically an open area designated for storage, mockups, future expansion, a hypobaric chamber, and a portable clean room.

Both floors of the south structure contain office space for facility personnel and visiting investigators, with a conference room on the first floor. Exterior to the building are an emergency generator (northeast side) and an incinerator (rear). Figure 3-1 shows the overall floor plan of the facility. Tables 3-1 and 3-2 provide the detailed room schedules for the first and second floors, respectively.

The LSSF provides environmental control, fire protection, cranes, fluids and gases, plant growth chambers (phytotrons), autoclaves and washers, an elevator, an incinerator, laboratory support equipment, mechanical equipment, and office equipment. In addition to the built-in equipment (table 3-3) and facility systems, the LSSF provides movable equipment (table A-1), animal handling equipment (table A-2), and laboratory equipment (table A-3), listed in appendix A.

The mechanical payload support capabilities are presented by facility systems and then by functional areas shown in figure 3-2.

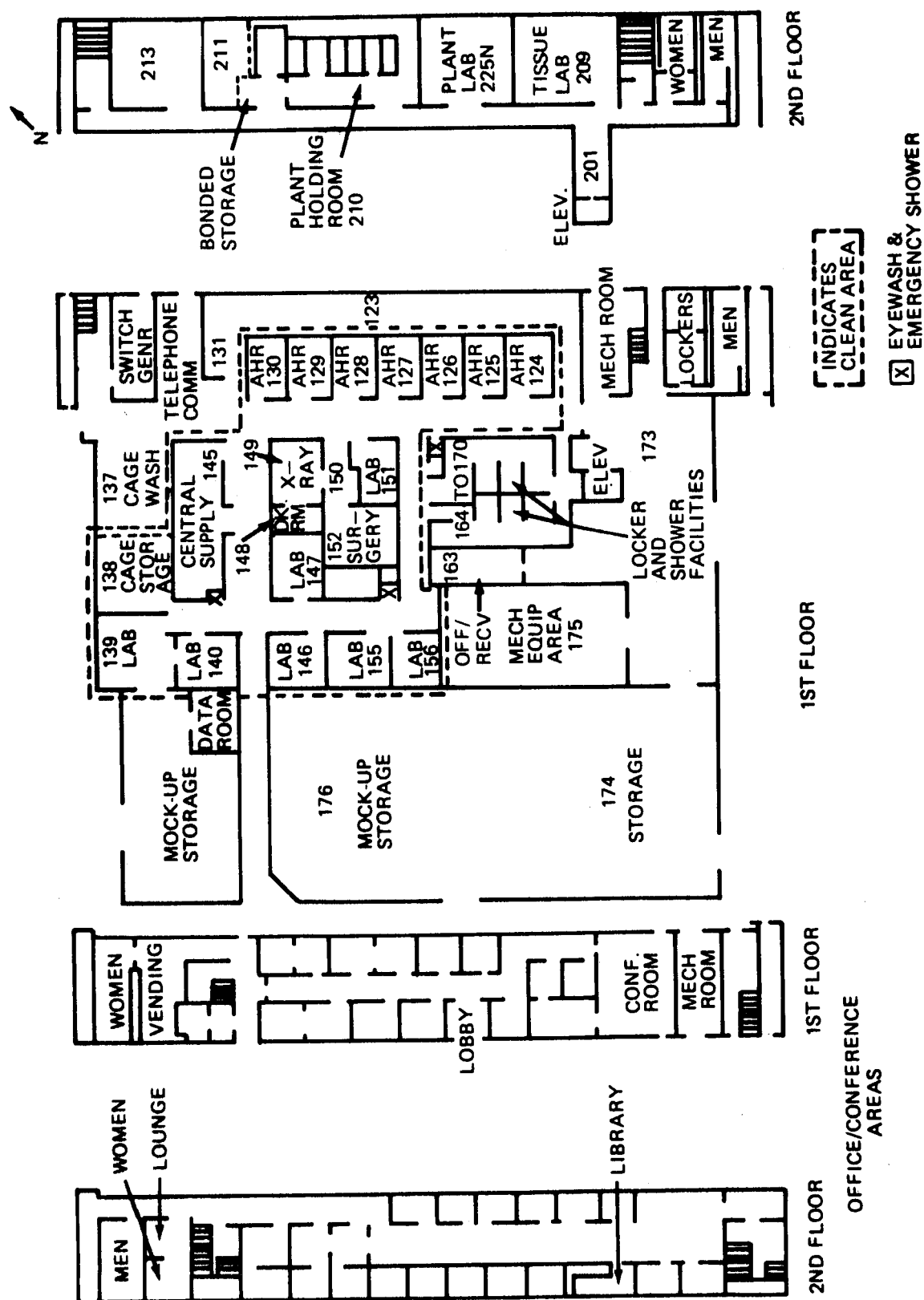


Figure 3-1. LSSF Floor Plan

Table 3-1. First Floor Room Schedule, LSSF

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
95	10-2 (3.1)	10 (3.1)	9 (2.7)	3x7 (0.9 x 2.1)	VAT	GWB	Acoustic	Office
96	11 (3.4)	10-2 (3.1)	"	"	"	"	"	"
97	10-2 (3.1)	10 (3.1)	"	"	"	"	"	"
98	11 (3.4)	10-2 (3.1)	"	"	"	"	"	"
99	10-2 (3.1)	10 (3.1)	"	"	"	"	"	"
100	"	"	"	"	"	"	"	"
101	"	"	"	"	"	"	"	"
102	"	"	"	"	"	"	"	"
103	"	"	"	"	"	"	"	"
104	12 (3.7)	10-2 (3.1)	"	8x7 (2.4 x 2.1)	"	"	"	Main Lobby
105	10-2 (3.1)	"	"	3x7 (0.9 x 2.1)	"	"	"	Office
106	"	"	"	"	"	"	"	"
107- 109	17 (5.2)	"	"	"	"	"	"	NASA Office Suite
108	18 (5.5)	"	"	"	"	"	"	NASA Office
110	25-3 (7.7)	22 (6.7)	"	5x7 (1.5 x 2.1)	"	"	"	Conference Room
111	"	10 (3.1)	15 (4.6)	"	Cement	K Cement	K Cement	Mech. Equip. Room
112	75-2 (22.9)	5 (1.5)	9 (2.7)	---	VAT	"	Acoustic	Corridor

Table 3-1. First Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
113	25-3 (7.7)	16 (4.9)	9 (2.7)	3x7 (0.9 x 2.1)	VAT	K Cement	Acoustic	Back Lobby
114	14 (4.3)	10 (3.1)	"	2-9x7 (0.8 x 2.3)	"	"	K Cement	Vending
115	25-3 (7.7)	8 (2.4)	"	3-6x7 (1.1 x 2.1)	"	"	"	Women's Toilet
116	12 (3.7)	7 (2.1)	---	"	Cement	"	"	Stairs 1
117	25-3 (7.7)	"	---	5x7 (1.5 x 2.1)	"	"	"	Stairs 2
118	"	8 (2.4)	9 (2.7)	3x7 (0.9 x 2.1)	"	"	"	Men's Toilet
119	14 (4.3)	10 (3.1)	"	2-6x7 (0.8 x 2.1)	Sealed	"	Acoustic	Locker Room
120	10 (3.1)	7 (2.1)	"	"	"	"	K Cement	Shower
121	21 (6.4)	7-6 (2.2)	"	5x7 (1.5 x 2.1)	Cement	Cement	Cement	Stairs 3
122	25-3 (7.7)	14 (4.3)	15 (4.6)	"	Sealed	"	"	Mechanical Room
123	86 (26.2)	7 (2.1)	9 (2.7)	"	Resin	Stud & Lath/ CEM PLAS	Acoustic	Contam. Corridor
124	17 (5.2)	8-6 (2.6)	"	3-6x7 (1.1 x 2.1)	"	"	Plaster	AHR 1
125	"	"	"	"	"	"	"	AHR 2
126	"	"	"	"	"	"	"	AHR 3
127	"	"	"	"	"	"	"	AHR 4
128	"	"	"	"	"	"	"	AHR 5
129	"	"	"	"	"	"	"	AHR 6
130	"	"	"	"	"	"	"	AHR 7

Table 3-1. First Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
131	25-3 (7.7)	10 (3.1)	9 (2.7)	6x7 (1.8 x 2.1)	Resin	CMU/CEM PLAS	Acoustic	Contain. Corridor
132	9-6 (2.9)	9-6 (2.9)	15 (4.6)	5x7 (1.5 x 2.1)	Sealed	CMU	Cement	Telephone Room 1
133	"	8 (2.4)	"	3x7 (0.9 x 2.1)	"	"	"	Telephone Room 2
134	16-6 (5.0)	16-6 (5.0)	8-6 (2.6)	5x7 (1.5 x 2.1)	Resin	CMU/CEM PLAS	Acoustic	Corridor
135	25-3 (7.7)	10 (3.1)	15 (4.6)	3x7 (0.9 x 2.1)	Sealed	Cement	CMU	Switchgear Room
136	"	8 (2.4)	---	5x7 (1.5 x 2.1)	Cement	CMU	Cement	Stair 4
137	30-9 (9.4)	18 (5.5)	9 (2.7)	6x8 (1.8 x 2.4)	Resin	CMU/CEM PLAS	K Cement	Cage Wash
138	19-9 (6.0)	"	"	3x6 (0.9 x 1.8)	"	CEM/ PLAS	"	Clean Cage Storage
139	18-7 (5.7)	17 (5.2)	14 (4.3)	5x12 (1.5 x 3.7)	"	"	"	Ground Control Lab 2
140	15-2 (4.6)	14 (4.3)	"	"	"	"	"	Ground Control Lab 1
141	37 (11.3)	7 (2.1)	8-6 (2.6)	5x7 (1.5 x 2.1)	"	"	Acoustic	Corridor
142	62-5 (19.0)	"	"	"	"	"	"	Corridor
143	30-3 (9.2)	"	"	3x7 (0.9 x 2.1)	"	"	"	Corridor
144	73 (22.3)	9-6 (2.9)	"	5x7 (1.5 x 2.1)	"	CMU/ PLAS	"	Clean Corridor
145	36-8 (11.2)	11-4 (3.5)	9 (2.7)	3-6x7 (1.1 x 2.1)	"	"	Lay-in	Central Supply
146	14 (4.3)	14 (4.3)	"	"	"	"	K Cement	Lab 3

Table 3-1. First Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
147	16 (4.9)	11-8 (3.6)	9 (2.7)	3-6x7 (1.1 x 2.1)	Resin	CMU/ PLAS	K Cement	Lab 4
148	12 (3.7)	6-8 (2.0)	"	3x7 (0.9 x 2.1)	"	"	"	Dark Room
149	15 (4.6)	12 (3.7)	"	5x7 (1.5 x 2.1)	Conduct. Elasto.	GWB LD SHT	"	X-ray
150	"	6 (1.8)	"	"	Resin	CEM PLAS	K Cement	Corridor
151	14-11 (4.5)	9 (2.7)	"	6x7 (1.8 x 2.1)	"	"	"	Lab 5
152	18-2 (5.5)	15-2 (4.6)	"	5x7 (1.5 x 2.1)	Conduct. Elasto.	"	"	Surgery
153	13-4 (4.1)	7-9 (2.4)	"	3x7 (0.9 x 2.1)	Resin	"	"	Utility Room/ Storage
154	4-11 (1.5)	4-6 (1.4)	"	"	"	"	"	Storage
155	14 (4.3)	14 (4.3)	"	3-6x7 (1.1 x 2.1)	"	"	"	Lab 2
156	"	11-6 (3.5)	"	3x7 (0.9 x 2.1)	VAT	"	Lay-in	Lab 1 (analytical)
157	3-10 (1.2)	3-6 (1.1)	8 (2.4)	---	Cement	K Cement	K Cement	Eyewash & emergency shower
158	4-6 (1.4)	2-6 (0.8)	"	---	"	"	"	"
162	3 (0.9)	3 (0.9)	"	---	"	"	"	"
163	22-10 (7.0)	8 (2.4)	"	3x7 (0.9 x 2.1)	Sealed	GWB	GWB	Office & Receiving
164 to 170	35-4 (10.8)	25-6 (7.8)	"	"	Resin	GWB/CEM PLAS	GWB	Shower & Locker Rooms- Men & Women
173	70-6 (21.5)	46-6 (14.2)	---	---	Cement	CMU Wire fence	---	Animal loading & unloading

Table 3-1. First Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
174	72-9 (22.2)	46-4 (14.1)	---	---	Cement	CMU/ wire fence	---	Storage- (open to high bay)
175	44 (13.4)	26-2 (7.9)	---	---	"	"	---	Mech. Equip. Area
176	21 (6.4)	28-6 (8.7)	---	---	"	"	---	Storage (open to high bay)
Data Room	26-2 (7.9)	15-2 (4.6)	9 (2.7)	8x9 (2.4 x 2.7)	Raised VAT	GWB	Acoustic	Data Control Room

GWB - Gypsum wallboard
 CMU - Concrete masonry unit
 VAT - Vinyl asbestos tile
 CEM PLAS - Cement plaster
 K Cement - Keene's cement

Table 3-2. Second Floor Room Schedule, LSSF

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
201	17-4 (5.3)	8-8 (2.6)	9 (2.7)	---	VAT	CEM PLAS	Lay-in	Elevator Corridor
202	128-6 (39.2)	5-6 (1.7)	"	7-6 (2.3)	"	"	"	Corridor
203	17 (5.2)	4-4 (1.3)	"	3x7 (0.9 x 2.1)	"	"	"	"
204	4 (1.2)	3 (0.9)	"	2-6x7 (0.8 x 2.1)	"	"	"	Janitor Closet
205	21 (6.4)	7-9 (2.4)	"	"	Sealed	"	Cement	Men's Toilet

Table 3-2. Second Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in (m)	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
206	9-9 (2.9)	8 (2.4)	9 (2.7)	2-6x7 (0.8 x 2.1)	Sealed	CEM PLAS	Cement	Women's Lounge
207	12 (3.7)	9 (2.9)	"	"	VAT	"	"	Women's Toilet
208	19 (5.8)	7-6 (2.3)	"	3-6x7 (1.1 x 2.1)	Cement	"	"	Stair 3
209	26 (7.9)	19-5 (5.9)	"	5x7 (1.5 x 2.1)	Resin	CMU/CEM PLAS	Acoustic	Tissue Lab
210	29 (8.8)	"	"	"	"	"	"	Growth Chamber Lab
211	20-6 (6.3)	"	"	"	"	"	Lay-in	Locked Storage
213	"	"	"	"	VAT	Acous- tic	"	Biomed Com- puter Room
214	18-6 (5.6)	8 (2.4)	"	3-6x7 (1.1 x 2.1)	Cement	K Cement	Cement	Stair 4
215	117-2 (35.7)	5 (1.5)	"	3x7 (0.9 x 2.1)	VAT	GWB	Acoustic	Corridor
216	20 (6.1)	10-2 (3.1)	"	"	"	"	"	Office
217	21 (6.4)	15-2 (4.6)	"	"	"	"	"	"
218	10-2 (3.1)	10 (3.1)	"	"	VAT	GWB	Acoustic	Office
219	"	"	"	"	"	"	"	"
220	"	"	"	"	"	"	"	"

Table 3-2. Second Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
221	10-2 (3.1)	10 (3.1)	9 (2.7)	3x7 (0.9 x 2.1)	VAT	G&B	Acoustic	Office
222	"	"	"	"	"	"	"	"
223	12 (3.7)	10-2 (3.1)	9 (2.7)	3x7 (0.9 x 2.1)	"	"	"	"
224	10-2 (3.1)	10 (3.1)	"	"	"	"	"	"
225 N	25 (7.6)	19-5 (5.9)	"	5x7 (1.5 x 2.1)	Resin	CMU/CEM PLAS	"	Plant Lab
225 S	10-2 (3.1)	10 (3.1)	"	3x7 (0.9 x 2.1)	VAT	G&B	Acoustic	Office
226	"	"	"	"	"	"	"	"
227	"	"	"	"	"	"	"	"
228	"	"	"	"	"	"	"	"
229	"	"	"	"	"	"	"	"
230	"	"	"	"	"	"	"	"
231	19-2 (5.8)	10-6 (3.2)	"	"	"	"	"	"
232	"	10-4 (3.2)	"	"	"	"	"	"
233	"	11-2 (3.4)	"	"	"	"	"	"
234	9-6 (2.9)	7 (2.1)	---	"	Sealed	Cement	CEM PLAS	Women's Lounge
235	12 (3.7)	9-6 (2.9)	---	"	"	"	"	Women's Toilet

Table 3-2. Second Floor Room Schedule, LSSF (Continued)

Room No.	Length ft-in (m)	Width ft-in (m)	Ceiling Height ft-in	Doorway ft-in (m)	Floor	Wall	Ceiling	Function(s)
236	21-6 (6.6)	8-6 (2.6)	---	3x7 (0.9 x 2.1)	Sealed	Cement	CEM PLAS	Men's Toilet
237	4 (1.2)	3 (0.9)	9 (2.7)	"	"	"	"	Janitor Closet
238	19 (5.8)	7-6 (2.3)	---	3x7 (0.9 x 2.1)	"	"	Cement	Stair 1
239	"	"	---	"	"	"	"	Stair 2
240	7 (2.1)	5 (1.5)	---	3-6x7 (1.1 x 2.1)	VAT	Cement	"	Entry Corridor

GWB - Gypsum wallboard
 CMU - Concrete masonry unit
 VAT - Vinyl asbestos tile
 CEM PLAS - Cement plaster
 K Cement - Keene's cement

Table 3-3. LSSF Built-In Equipment

Equipment	Quantity	Location	Remarks
Autoclaves: a) Large	1	Room 137	Castle Sybron 3230, 30 ft ³ (0.9 m ³), steam heat ranging 248°-275° F (120°-135° C), for handling wrapped goods, metal instruments, & liquids; conforms to ASME standards
b) Medium	1	Room 145	Ethylene oxide (ETO)/steam sterilizer with aerator, Castle Sybron 3260; 18 ft ³ (0.5 m ³), all other specifications as above; Castle Sybron 4041 ETO aerator
c) Small	3	Rooms 152, 225	One steam sterilized Castle, 2 Barnstead C-2260; for dressings, instruments, glassware, solutions, 6 ft ³ (0.2 m ³)
Benches, lab stand-up/sit-down	—	Rooms 140, 146, 147, 151, 155, 209, 225	Refer to Project No. PCN 83166 Modifications for Life Science Support Facility, NASA, Cape Canaveral Air Force Station Drawings A-7, A-8.
Benches, shop	3-4	In high bay areas (174 & 176)	For shop work, packing/shipping
Cage washer	1	Room 137	Consolidated Equipment & Supply Co.; automatic stainless steel; provides wash, rinse, & decontamination; approximately 4 ft (1.2 m) wide, 6.5 ft (1.9 m) high & 6 ft (1.8 m) long
Environmental (plant) chambers (walk-in)	5	Room 210	Four at 4 ft (1.2 m) x 8 ft (2.4 m); one at 6.5 ft (1.9 m) x 9.6 ft (2.9 m)

Table 3-3. LSSF Built-In Equipment (Continued)

Equipment	Quantity	Location	Remarks
Fire extinguishers	Numerous	Throughout facility	Halon 1211, wall-mounted & Class A
Fume hoods, radio-isotope	3	Rooms 140, 147, 225	Stainless steel Vectaire hood, Hamilton Industries
Fume hoods, standard	3	Rooms 146, 151, 155	Vectaire, Hamilton Industries
Glassware washer/Dryer	1	Room 145	Automatic, free standing, steam cycle; Consolidated Equipment & Supply Co.
Incinerator	1	N-W side of building	Volume in burning chamber 75 ft ³ (2.1 m ³) minimal, one or more primary combustion chambers, one secondary chamber, capable of incinerating 0 through 4 waste
Portable laminar flow unit	1	--	Class II unit protecting worker and specimen
Vent hoods	2	Over cage washer & glassware washer	Venting ducts indicated in First Floor Duct Layout Design (PCN 83166) for LSSF

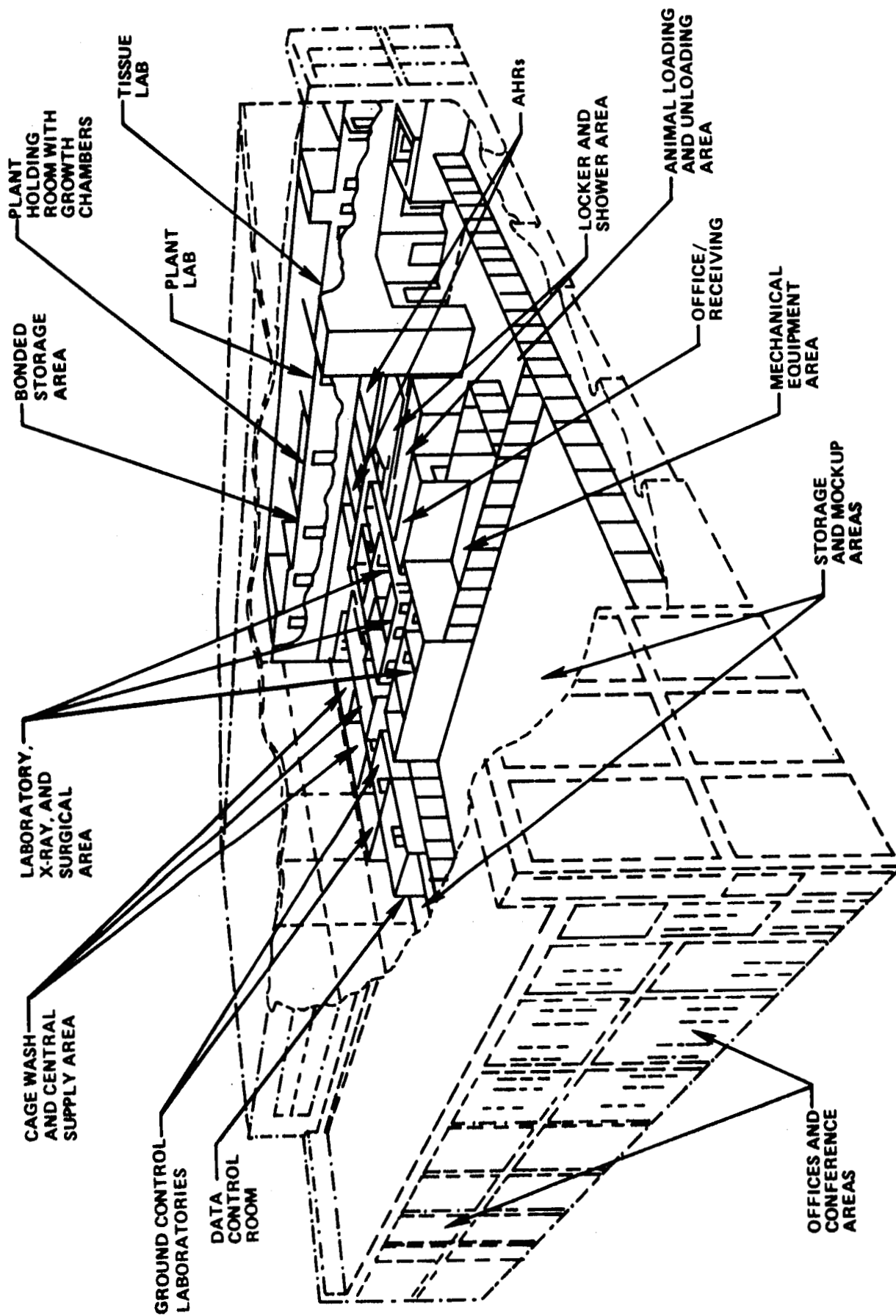


Figure 3-2. LSSF Isometric Showing Functional Areas

3.2 FACILITY SYSTEMS

3.2.1 ENVIRONMENTAL CONTROL. The heating, ventilating, and air-conditioning (HVAC) in the LSSF is provided by two separate systems. These systems provide a temperature of $72 \pm 2^\circ\text{F}$ ($22.2 \pm 1^\circ\text{C}$) and a relative humidity (RH) of 40% to 60% in all areas unless otherwise specified. The laboratories, AHRs, and the clean corridors receive 10 air changes per hour. The offices and plant holding room receive 6 changes per hour. The contaminated corridor and central supply (room 145) receive up to 12 changes per hour. The air handling units for the LSSF have 99.97% high efficiency particle air (HEPA) filters and bring in 100% outside fresh air.

The first floor lab/AHR complex is maintained at a positive pressure relative to the outside air. The AHRs are maintained at the highest positive pressure, and the temperature can be controlled from 70° to 78°F (21.1° to 25.6°C). The labs, surgery, x-ray, and clean corridors are maintained at the next highest positive pressure, and the contaminated corridor positive pressure is slightly less than that of the clean corridor. Animals are kept in laminar flow cages in the AHRs and are transported in enclosures that prevent the transfer of pathogens.

All laboratory fume hoods are vented to the outside of the building. The fume hoods rated for radioisotope use are vented at a height sufficient to disperse contaminants. All autoclaves and washers have vent hoods and sufficient exhaust fans to remove steam and heat.

Air delivered to the laboratories, clean corridor, and AHRs is 100% fresh and filtered to remove dust, micro-organisms, and hydrocarbons. The HEPA filters used are burned in the incinerator. Unidirectional flow is provided in AHR 1 (room 124) and surgery (room 152).

3.2.2 FIRE PROTECTION. The LSSF is protected by a 16-zone (11 in use) non-coded system with zone alarm annunciation. Manual stations are provided at locations along exit paths from rooms and in the corridors. Heat-actuated detectors (136°F [57.3°C] fixed temperature, $15^\circ\text{F}/\text{min}$ [$8.3^\circ\text{C}/\text{min}$] rate of rise) are provided in the ceilings of laboratories, other work areas, surgery, storage areas, and mechanical and electrical rooms. Ionization type detectors are provided in all AHRs, the plant holding room, the data control room, as well as in the ducts of the air handling units.

The building is divided into logical zones, and the manual stations and detectors within each zone are separately circuited to indicate the zone in which an alarm is initiated. The existing high bay sprinkler system actuation alarms are considered a separate zone. Operation of any initiating device in any zone causes a general alarm signal. Alarm bells are electric, solenoid-operated, plunger type vibrating under a dome and are located to provide complete coverage. Operation of the ionization-type duct-mounted detectors causes shutdown of the air handling unit in which the particular detector is located. A visual zone annunciator is installed in the lower floor, stairwell

4 (northeast side) to provide firefighters with a rapid indication of the zone in which the alarm was initiated. The system is tied into the CCAFS base system by a base system code transmitter. There is an alarm indicator over every AHR door in the contaminated corridor (room 123 in table 3-1).

Portable fire extinguishers, both Class A type and Halon 1211, are located throughout the facility.

3.2.3 CRANES. The central high bay has two 25-ton (22.7-metric ton) bridge cranes. One crane operates over the north side of the high bay; the other, over the south portion of the high bay. Crane travel is east-west. Vertical hook travel is from the floor to approximately 24 ft (7.3 m).

3.2.4 FLUIDS AND GASES.

3.2.4.1 Compressed Air. Each laboratory (rooms 140, 146, 147, 151, 155, 225N) contains compressed air at 100 lb/in² (6.8 bars) gage. A reciprocating compressor supplies up to 6 ft³/min (0.2 m³/min) of oil-free compressed air. The compressed air system is separated into three zones and valved so that any one zone can be shut down without affecting the other two.

3.2.4.2 Vacuum Services. The laboratories (rooms 140, 146, 147, 151, 155, 225N) have vacuum service available on the fume hoods, one outlet on each side, as well as outlets in the rooms. The vacuum unit provides 12 ft³/min (0.3 m³/min) free air displacement. A portable wet-vacuum system is used for cleaning after washdown in the AHRs.

3.2.4.3 Water. Hot and cold facility water is provided to all rooms with sinks (rooms 137, 140, 145, 146, 147, 150, 151, 155, 209, 225N, and all seven AHRs) and the restrooms and showers. Water fountains throughout the facility are supplied by potable water. A deionized (DI) water system supplies all lab and experiment support areas with sinks with 1 megohm DI water. The primary DI system is in the mechanical room near stair 3, first floor. An 18-megohm supply will be available in mid 1983 in rooms 145 and 225N from polishing units that include a 0.22-micron filter for bacteria. DI water is also available to the growth chamber wet bulb and humidifier. DI water specifications are available upon request.

3.2.4.4 Other Gases. Other gases (liquid propane gas, nitrogen, oxygen, etc.) are supplied by portable carts.

3.2.5 INCINERATOR. An oil-fired incinerator is located outside and to the rear of the facility. It is rated for 75 yd³ (57.3 m³) minimum of waste material storage with an incineration rate of 65/50 lb/h (29.5/22.7 kg/h) for waste containing 85% water. The incinerator can dispose of 50 lb/h (22.7 kg/h) maximum pathologic waste with 85% water. This provides the capability to dispose of animal bedding, food, wastes, and carcasses. The incinerator outlet is over 50 ft (15.2 m) above the ground.

3.2.6 OTHER FACILITY SUPPORT. Rooms 111, 122, 132, and 133 provide mechanical, switchgear, and telephone support to the entire LSSF. Room dimensions and construction details are given in table 3-1.

3.3 PLANT EXPERIMENT SUPPORT AREAS

Rooms 209, 210, and 225N on the second floor of the north side are provided for support of plant, micro, and tissue culture experiments. (See figure 3-3.)

3.3.1 TISSUE LAB. Room 209, the tissue lab, is equipped with workbenches, overhead cabinets, a refrigerator, a Beckman J2-21 centrifuge, a laminar flow bench, and an emergency shower and eyewash station. Hot and cold facility and DI water are provided at the sink. See figure 3-4.

3.3.2 PHYTOTRONS. Room 210 contains the four walk-in environmental plant chambers. Each chamber has 18 ft² (1.7 m²) of wire bench. Each is 8 ft by 4 ft by 9 ft high (2.4 m by 1.2 m by 2.7 m) and can provide adjustable temperature, humidity, illumination, atmospheric composition, and airflow for a totally controlled environment. There is one vestibule area for two chambers. The chambers are accessed through 2-ft 6-in (0.8-m) wide doors from 5-ft by 8-ft (1.5-m by 2.4-m) vestibules (see figure 3-5).

An additional growth chamber 9 ft 7 in by 6 ft 5 in by 8 ft 3 in high (2.9 m by 1.9 m by 2.5 m) is in room 211 along the east wall next to the other chambers. Access to the fifth chamber can be through room 211 or room 210.

The phytotrons are lighted by fluorescent and incandescent fixtures mounted in a plastic barrier ceiling. Control panel and readouts are located on the outside of each chamber door.

3.3.3 PLANT LAB. Room 225N contains benches for planting specimens; radio-isotope-rated fume hood; microferm fermentor (Narco model 322); and a Castle autoclave, capacity 6 ft³ (0.2 m³), for sterilizing small laboratory equipment. Compressed air at 100 lb/in² (6.8 bars) is available as are chilled water, DI water, and vacuum services. A refrigerator and a Fisher Isotemp Vacuum Oven, model 281 are also in room 225N. Workbenches are individually lighted in addition to the ceiling mounted fixtures.

3.3.4 ELEVATOR. A 2500-lb (1134-kg) capacity hydraulic elevator provides access to the second floor of the north side. The door openings are 3 ft 6 in wide by 7 ft high (0.1 m by 2.1 m). The car interior is 6 ft 8 in wide by 4 ft 3 in deep (2.0 m by 1.3 m) with vinyl tile floor, overhead fluorescent lighting, forced ventilation system, telephone, quilt-draped walls, and a key-operated switch at the lower level to preclude after-hour access by unauthorized personnel.

3.3.5 OTHER SUPPORT. Room 213 is the Biomedical Office's computer room. Room 211 is set aside for bonded storage. The remaining rooms consist of men's and women's restrooms. Sizes for these rooms are listed in table 3-2.

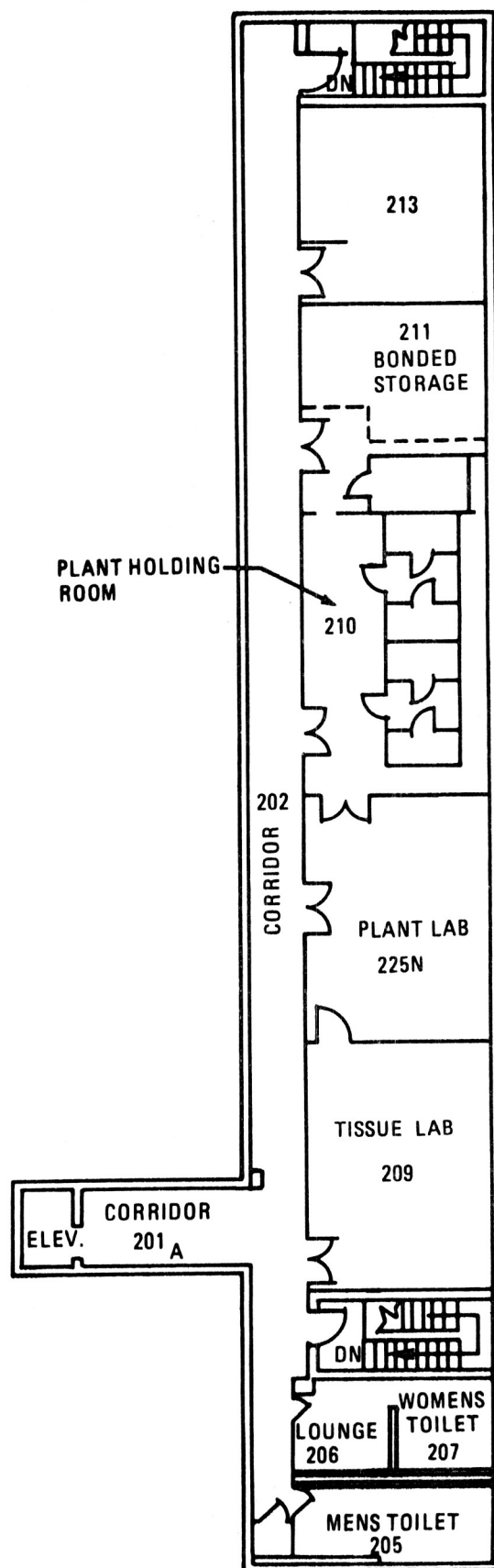


Figure 3-3. Plant Experiment Support Areas



Figure 3-4. LSSF Tissue Lab, Room 209

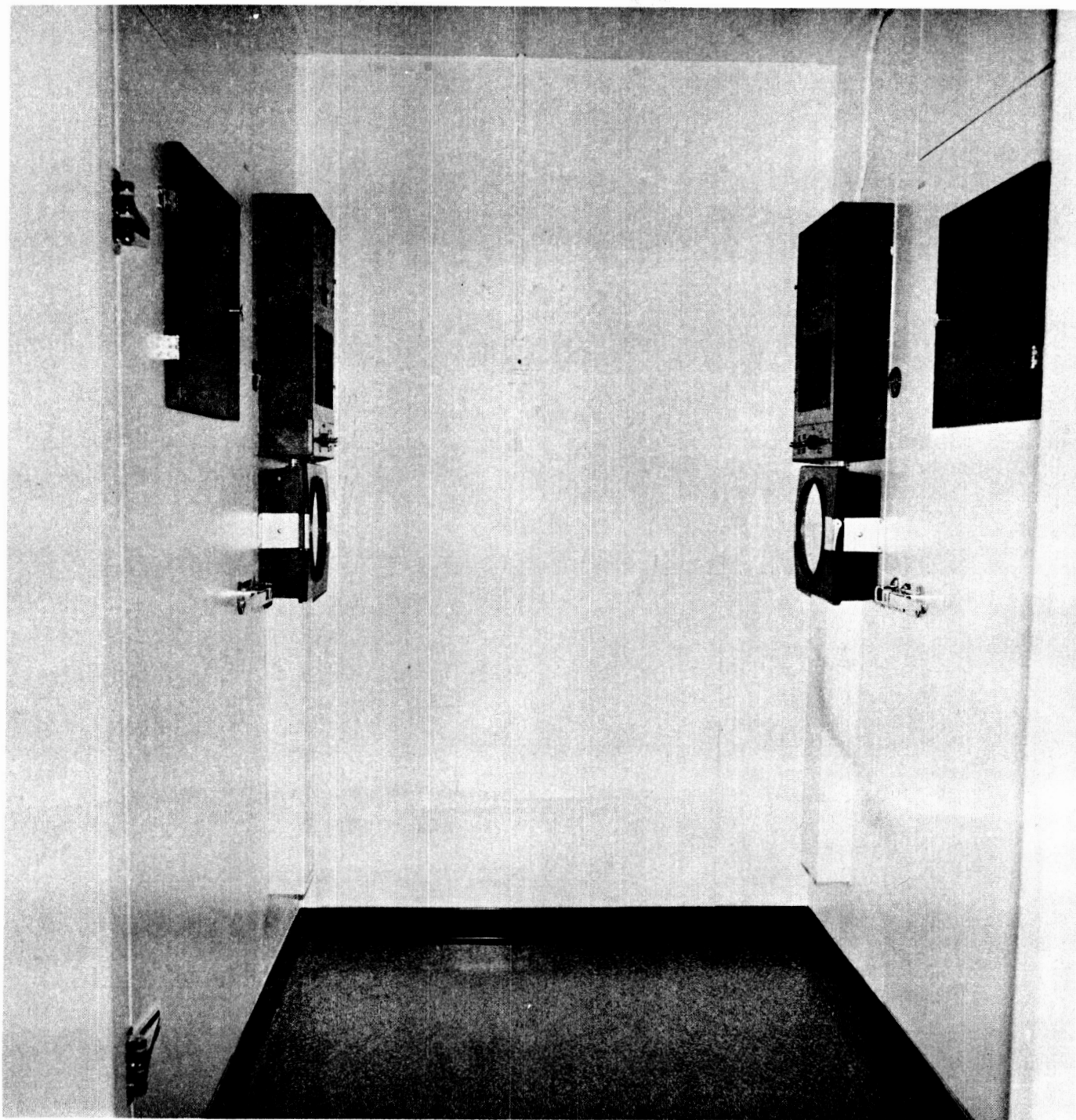


Figure 3-5. Phytotron Vestibule, LSSF

3.4 ANIMAL EXPERIMENT SUPPORT AREAS

For protection of facility personnel and animals, the animal experiment support areas are divided into the clean and contaminated areas (see designated areas in figure 3-1). The floors in the animal experiment support areas and the laboratories are sealed with epoxy, gloss, or semi-gloss enamel.

The clean areas, indicated by floors painted a rust color (like the clean corridor shown in figure 3-6), are used to bring in clean water, food, bedding, cages, and animals into the AHRs. The laboratories described in 3.5 also have the rust colored floors.

The contaminated areas (the corridor on the north of the AHRs and the cage wash area) are designated by floors painted a dull gold color. These areas are used to carry away soiled bedding, food pans, water containers, and cages, and to remove the sick, injured, and deceased animals.

3.4.1 AHRs. Each AHR has approximately 153 ft² (14.2 m²) of space. The seven rooms provide the same services. There are two doors to each AHR, one opening from the clean corridor to the AHR and the other from the AHR to the contaminated corridor. The doors are sound-seal stainless steel with glass viewing panels and lightproof covers for maintaining light cycles. They must be opened, both inside the AHR and from the corridors, with a key. Each AHR has positive laminar flow and air return, electrical power and lighting as described in section IV, and a wall-mounted multi-purpose vitreous china sink 22 in by 19 in (55.9 cm by 48.3 cm) with hot and cold facility and DI water.

AHRs 1 and 2 (rooms 124 and 125) have been designated for selected flight animals; AHR 7 (room 130), for stabilization and monitoring after the animals' arrival at the LSSF.

The corridors on either side of the AHRs, both clean and contaminated, have cushioned railings approximately 3 ft (0.9 m) above the floor. There is an alarm indicator over every AHR door in the contaminated corridor (room 123 in table 3-1) as part of the fire alarm system.

3.4.2 CAGE WASH/CLEAN STORAGE ROOMS. Room 137, figure 3-7, contains the cage washer and the 30-ft³ (0.9-m³) sterilizer (described in table 5-1). The automatic cage washer is capable of washing items measuring 5 ft long, 2 ft 6 in wide, and 6 ft high (1.5 m by 0.8 m by 1.8 m) at temperatures up to 180°F (82°C). The cage wash room is separated from clean cage storage (room 138) by a wall into which the passthrough cage washer is built. The 30-ft³ (0.9-m³) autoclave may be used for sterilizing cages; it, too, has a door opening into clean cage storage, room 138. Table 3-3 provides the details on this large autoclave and the cage washer.

In addition to the cage washer and large autoclave, room 137 contains a fiberglass sink supplied with facility water on the east wall, egress doors to stair 4 and the contaminated corridor, and the rollup steel door on the west leading outside to the incinerator.

Room 138 is used for storage of the cleaned animal handling equipment.

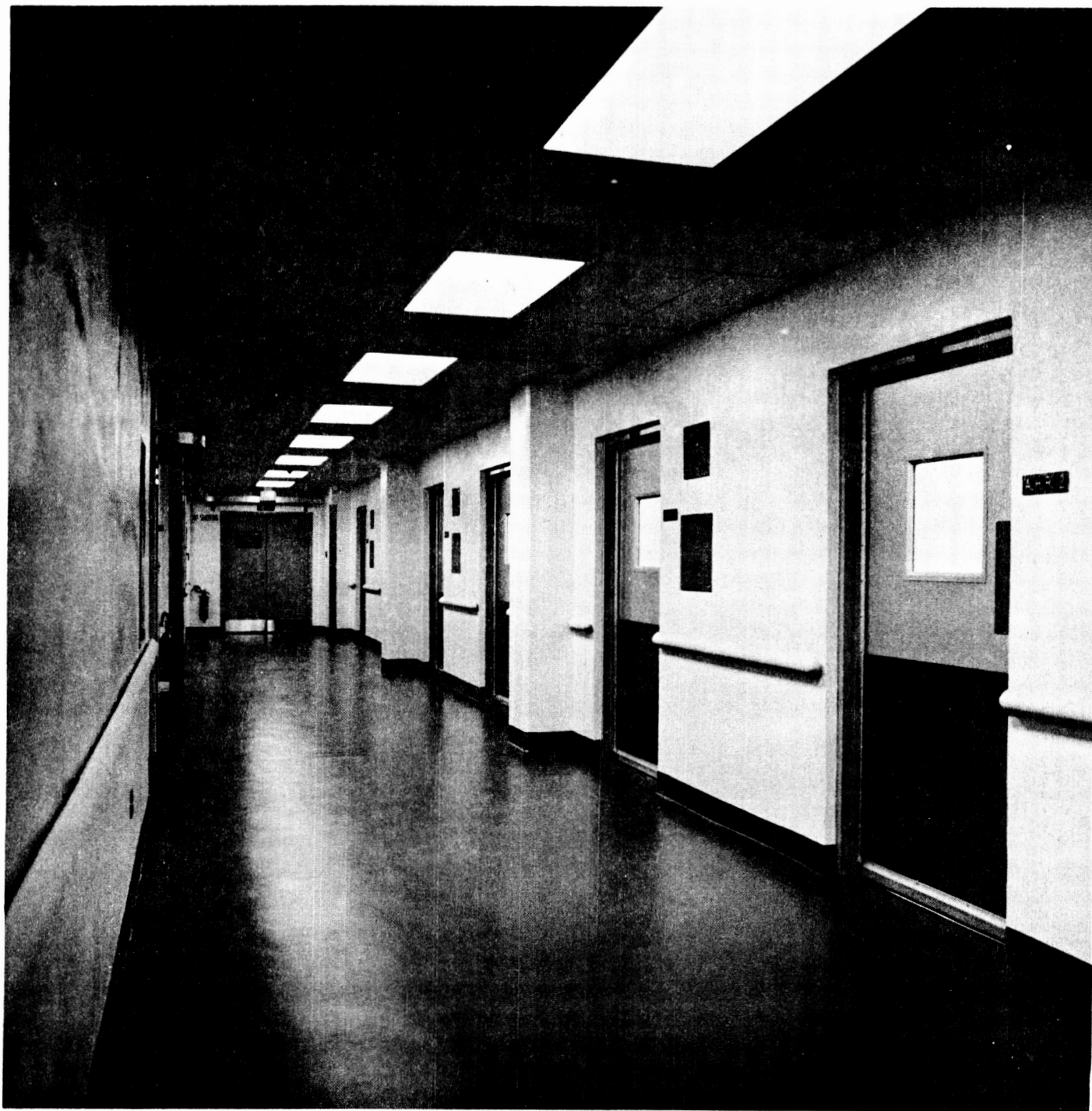


Figure 3-6. Clean Corridor, AHRs

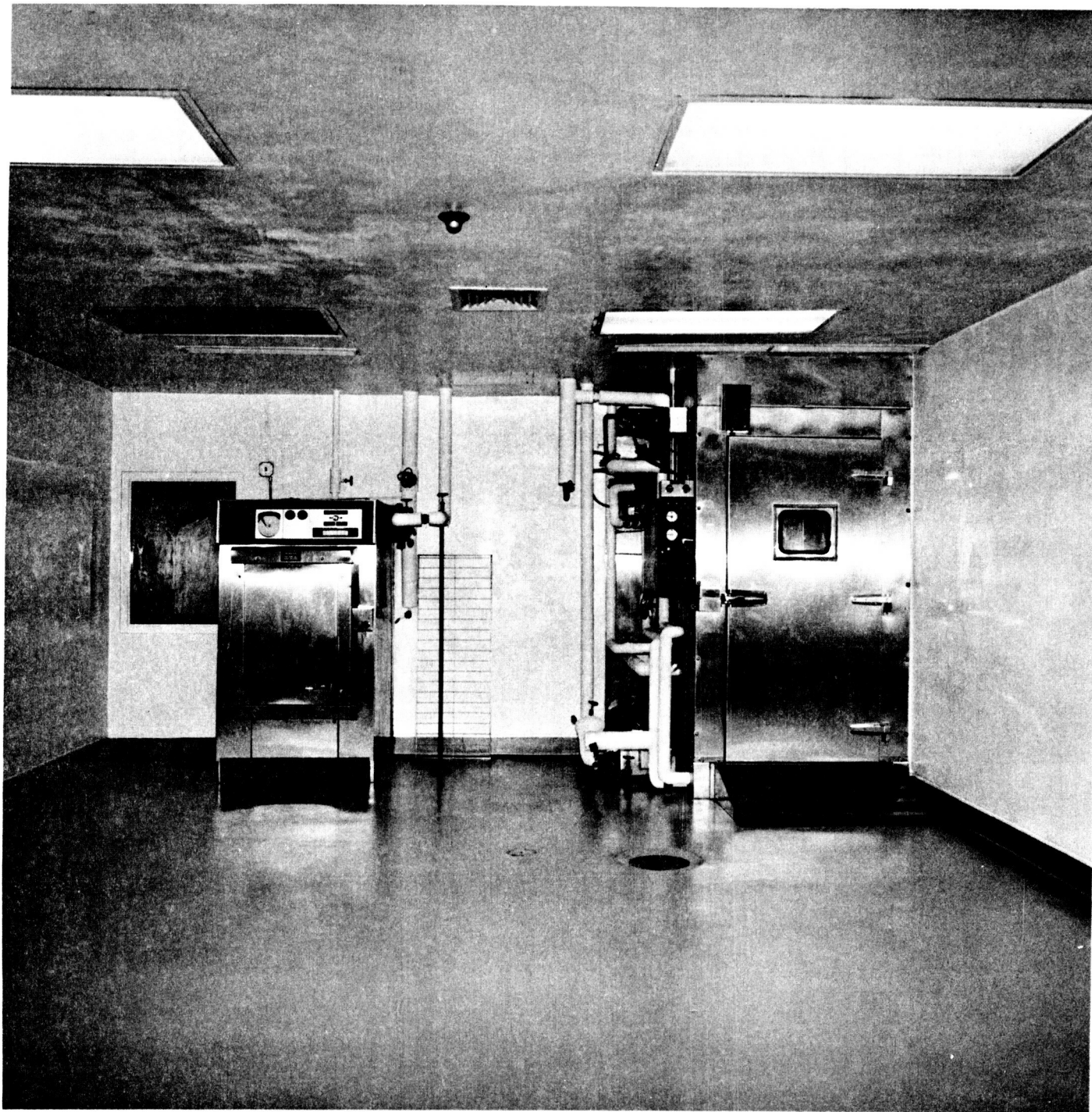


Figure 3-7. Cage Wash Area, Room 137

3.4.3 CENTRAL SUPPLY AREA. Room 145, central supply, contains approximately 415 ft² (38.6 m²). It has an 18-ft³ (0.5-m³) autoclave for sterilizing larger laboratory equipment and a glassware washer. The ethylene oxide (ETO) steam sterilizer will have an ETO gas monitor and aerator installed in mid 1983.

The fully automatic glassware washer is capable of accepting items 20 in by 20 in by 18 in high (50.8 cm by 50.8 cm by 45.7 cm).

Hot and cold facility and DI water are available at the sink. Lab benches and overhead cabinets are installed on the west and north walls. There are two doors to central supply, room 145. Outside central supply in corridor 141 there are two refrigerators, two freezers, an ice machine, and two low temperature storage freezers. See appendix A for details.

3.4.4 OFFICE/RECEIVING AREA. Room 163 is the office/receiving area for animal records entering the animal experiment support areas. Animal health records and other paperwork must be brought to this room before the arrival and acceptance of animals at the LSSF. The room contains a desk, chairs, bookcase, and file cabinet for animal records.

3.4.5 SHOWER/LOCKER ROOMS. Next to the office/receiving room, separate shower, locker, and restroom facilities are provided for men and women. Rooms 164 to 170 are for the use of the animal handlers/trainers only to prevent cross-contamination between the laboratory and animal support areas. All animal-contact personnel will enter and leave the LSSF through these rooms. Special clothing used by these personnel will be donned and removed in the locker rooms.

3.5 LABORATORIES

3.5.1 GROUND CONTROL LABS. Rooms 139 and 140 are ground control laboratories 2 and 1, respectively. Room 139 is an open lab with no lab/workbenches. AC electrical power and fluorescent lighting are the only services provided.

Room 140, ground control lab 1 (figure 3-8), contains a stainless steel fume hood rated for use of radioisotopes, lab benches and overhead cabinets, a sink with hot and chilled facility and DI water, compressed air, and vacuum outlets. Both ground control labs have 14-ft (4.3-m) ceilings. The two labs are joined by a 5-ft by 12-ft (1.5-m by 3.7-m) double door.

3.5.2 GENERAL PURPOSE LABS. The LSSF has five general purpose labs: room 156, lab 1; room 155, lab 2; room 146, lab 3; room 147, lab 4; and room 151, lab 5. Lab 1 provides ac electrical power and lighting only. Labs 2 through 5 provide electrical power and lighting, lab benches with no-seam Formica counter tops, overhead cabinets, sinks with hot and cold facility and 1-megohm DI water, compressed air, vacuum outlets, and fume hoods. The fume hood in room 147, lab 4, is stainless steel, rated for use with radioisotopes. Figure 3-9 shows a general purpose laboratory (room 155, lab 2).

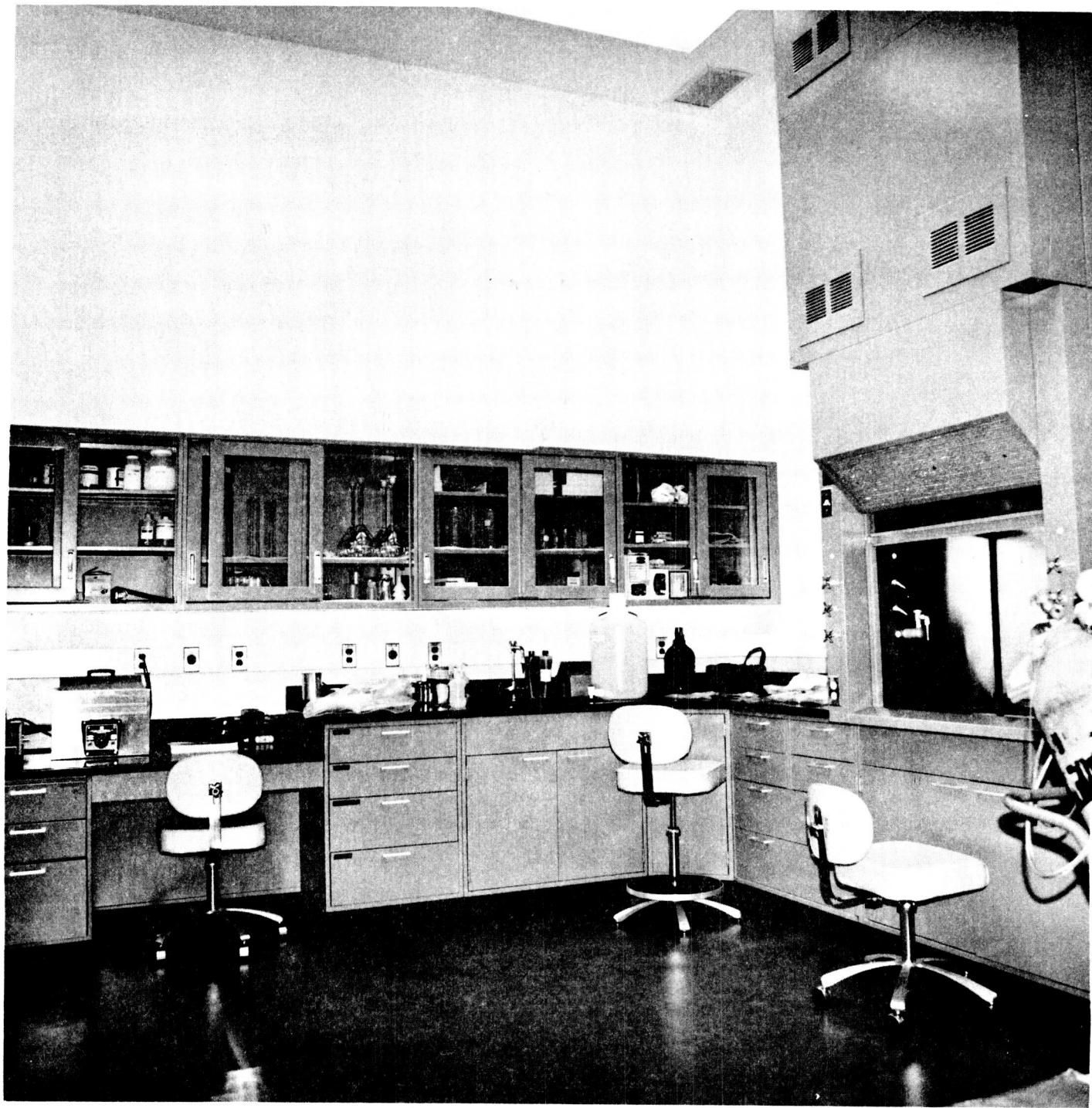


Figure 3-8. Ground Control Lab 1, Room 140

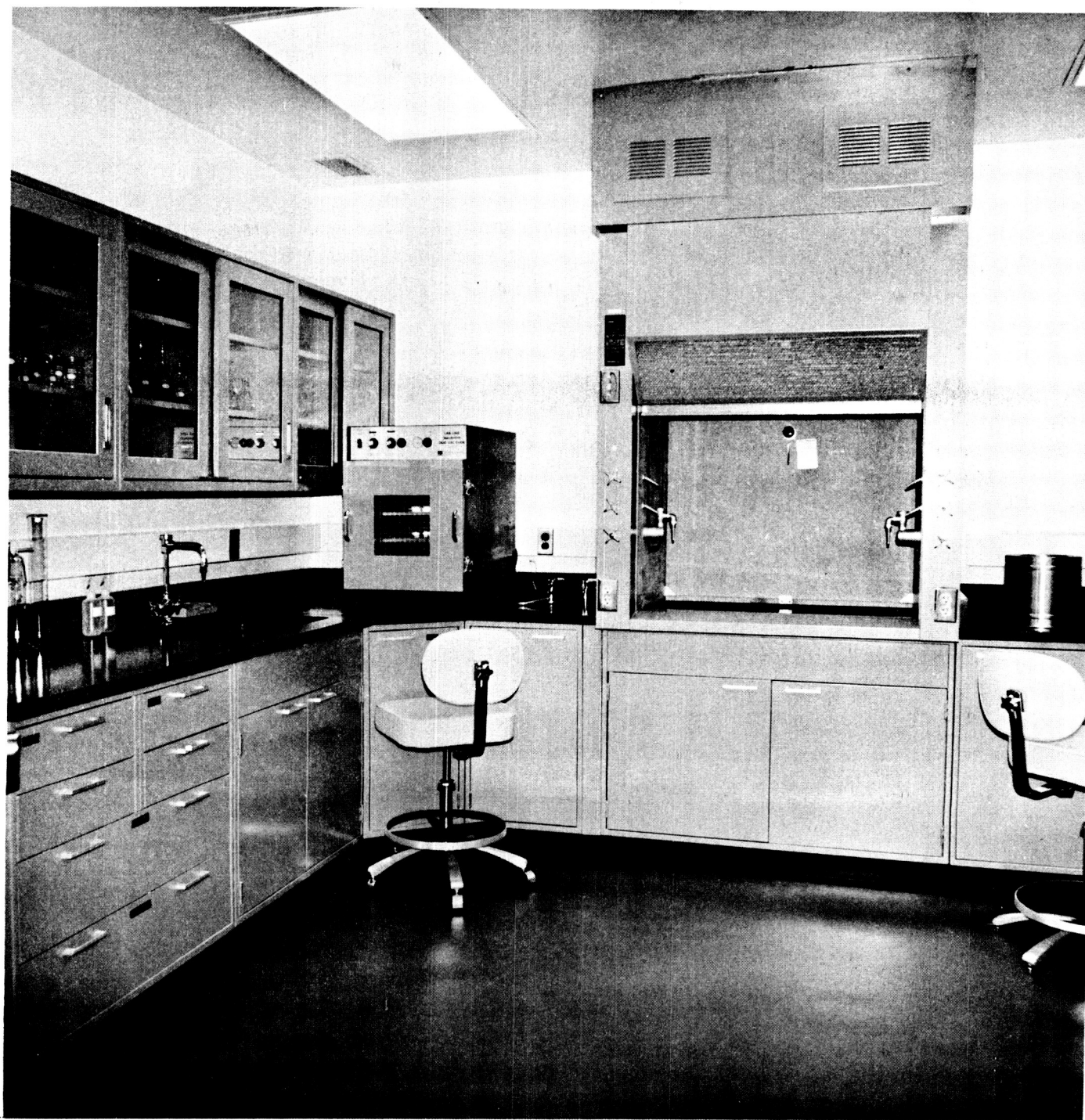


Figure 3-9. General Purpose Lab 2, Room 155

3.6 SURGERY/X-RAY AREA

Rooms 152, 150, 149, and 148 make up the surgery and x-ray area. Room 152, surgery, provides lighting and electrical power and has a conductive elastomer floor. Room 150, the vestibule/alcove for this area, contains shelving for supplies and a 28-in by 22-in (71.1-cm by 55.9-cm) wall-mounted vitreous china scrub sink with hot and cold facility and DI water. Room 149, x-ray, is lead lined (walls and door) and lightproof. The Joseph S. Ames Research Center (ARC) will transfer the x-ray unit to KSC when it is needed. The x-ray dark-room, room 148, contains the F-140 Filmatic Processor, a lab bench, and an overhead cabinet.

3.7 DATA CONTROL ROOM

The data control room can be accessed from the west end of the high bay without entering the clean laboratory area. It has its own air-conditioning unit with 33% efficient filters located on the roof of the control room. Cooling is provided both above and below the raised flooring.

The LSSF-provided equipment in this room are the power conditioner (figure 3-10) and the monitor console. The power conditioner (Conditioned Power Corporation 480-V, 3-phase synthesizer) provides clean, 3-phase power to power-sensitive equipment. It maintains output voltage within +3%, -1% of specifications during input fluctuations from +15% to -30% of nominal under any load condition.

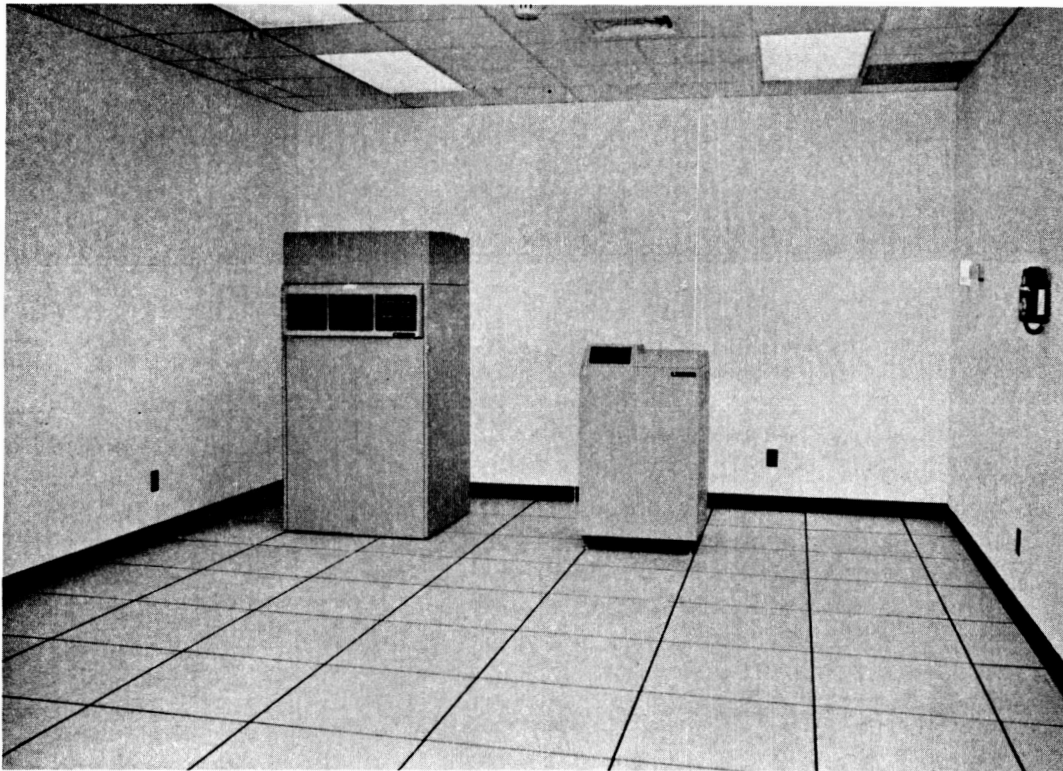


Figure 3-10. Data Control Room Power Conditioner

The conditioner will maintain the output power supply to within +4% and -10%. The monitor console provides through LED readings power monitoring and alarm on out-of-tolerance voltage, transformer overtemperature, frequency deviation, ground overcurrent, and integrity failure.

Instrument power is provided under the floor, raised approximately 18 in (45.7 cm) off the concrete slab; 120/208-V and 240-V power can be supplied. (See section IV.) Requests for specific power in the data control room should be made through the LSSM.

The data control room is part of the facility fire protection system described in 3.2.2. Ionization detectors under the raised floor are at least 2 ft (0.6 m) from the air-conditioning ducts.

3.8 HIGH BAY AREA

This section of the LSSF, measuring approximately 69 ft by 160 ft and 27 ft high (21.0 m by 48.7 m by 8.2 m), is basically an open high bay for storage and any mockups that might be required. The areas within this high bay are surrounded by 7-ft (2.1-m) chain link fencing. Gates are kept locked for control. The concrete floor has been sealed with epoxy paint.

3.8.1 PORTABLE CLEAN ROOM. A portable Class 10,000 clean room, 16 ft by 12 ft by 16 ft high (4.9 m by 3.7 m by 4.9 m), is located in the southern half of the central high bay. See figure 3-11. Access is controlled by the locked chain link fence surrounding the area.

3.8.2 HYPOBARIC CHAMBER. Hypobaric Chamber M, formerly located in the O&C Building on KSC during the Apollo and Skylab Program, will be installed in the south central high bay in early 1984. The chamber is 25 ft (7.6 m) tall and 13 ft (3.9 m) in diameter and has internal dimensions of 10 ft 10-1/2 in (3.3 m) diameter and 14 ft 9 in (4.5 m) height. The chamber is lighted by fluorescent fixtures and has an 8-ft (2.4-m) airlock.

3.8.3 MECHANICAL EQUIPMENT AND MOCKUP AREAS. A small section of the central high bay is occupied by the two HVAC units that support the LSSF and by other facility mechanical equipment. The remainder of the fenced high bay is available for non-air-conditioned secured storage, mockups, or future laboratory expansion.

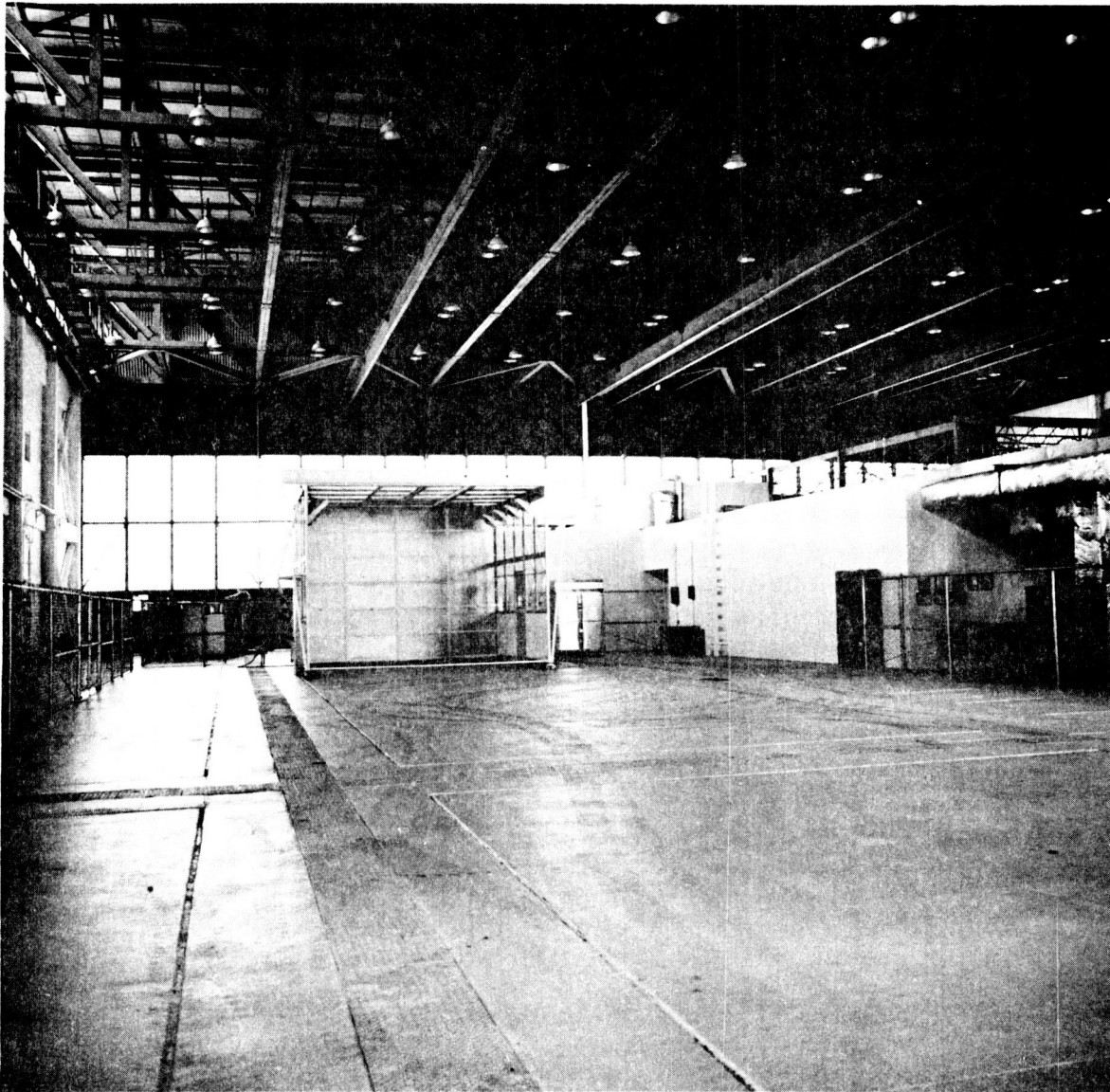


Figure 3-11. Portable Clean Room in South Central High Bay

3.9 OFFICE/CONFERENCE AREAS

Both floors of the south structure contain offices, a conference room, restrooms, a mechanical room, and a vending machine area. The first floor is set aside for LSSF facility management staff, both NASA and contractor. The second floor is available for use by the visiting experiment and mission personnel. Tables 3-1 and 3-2 provide the room schedules, and figure 3-12, the layout of the office/conference areas. Standard office furniture will be provided - desks, tables, chairs, and filing cabinets. Requests for office space and equipment must be made through the LSSM.

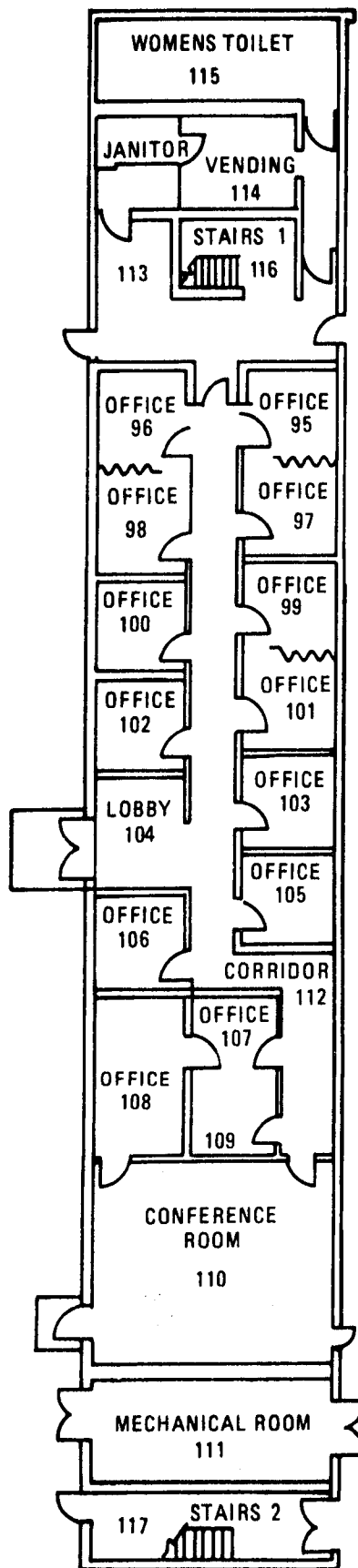
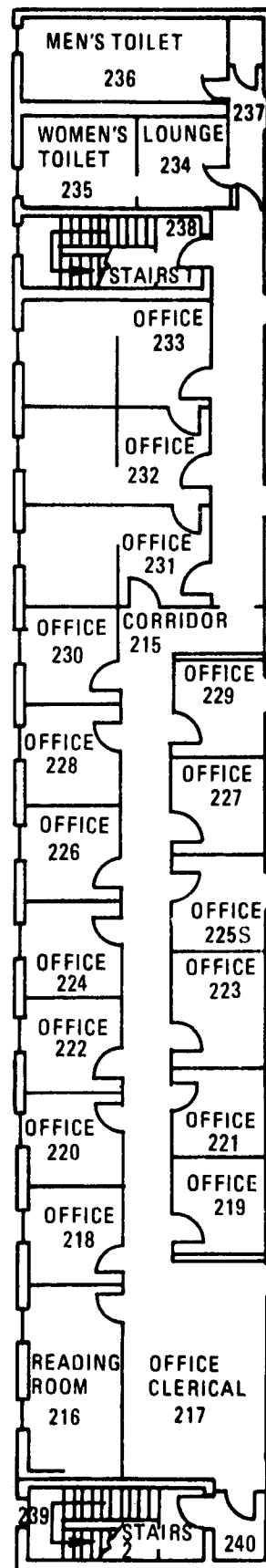
FIRST
FLOORSECOND
FLOOR

Figure 3-12. Office Areas, LSSF South Side

SECTION IV ELECTRICAL SYSTEMS

4.1 GENERAL

Electrical service is supplied to the building by two substations: one rated at 750 kVA provides 480-V, 3-phase, 3-wire power; the other rated at 300 kVA provides 120/208-V, 3-phase, 4-wire power. This power is distributed to power and lighting branch circuit panelboards and other large loads throughout the building from one 480-V and two 120/208-V distribution panelboards located in the switchgear room (north side).

4.2 STANDARD ALTERNATING CURRENT (AC) ELECTRICAL POWER

120-V ac, 30-A, 60-Hz, 1-phase receptacles are available in each room of the LSSF. All receptacles in the AHRs are fitted with waterproof, stainless steel, spring-loaded cover plates. Receptacles in the cage wash area next to the cage washer and larger autoclave have waterproof covers.

Room 152, surgery, is supplied by isolated power supplies having integral branch circuit breakers of the type used in hospitals. Ungrounded 120-V ac, 5-kVA; 240-V ac, 15-kVA; and 250-V ac (for mobile x-ray) power is provided.

All receptacles are wall mounted approximately 18 in (45.7 cm) above the floor, except for those mounted below the overhead cabinets and above the counters in the labs and central supply, those in surgery, and those in the AHRs. Receptacles in the labs mounted above the cabinet top surface are either on a strip or separate duplex receptacles on the wall. The special receptacles in surgery (room 152) are mounted over 5 ft (1.5 m) above the floor. The receptacles in the AHRs are approximately 4 ft (1.2 m) above the floor.

Table 4-1 identifies the ac power available in the LSSF. The SID 79K24867 provides the detailed LSSF electrical interfaces.

4.3 INSTRUMENT QUALITY POWER AND GROUNDING

250-V ac and 120/208-V ac, 3-phase instrument quality power is provided to the ground control labs 1 and 2 (rooms 140 and 139), the general purpose labs (rooms 146, 147, 151, and 155), the electronics workshop (room 213), and the data control room in the central high bay. This power is from a 150-kVA transformer feeding only those outlets. Wire grounds are routed back from each instrument quality power outlet and tied to this transformer. Radio frequency interference shielding is established at the transformer by electrostatic shields between the primary and secondary windings.

Table 4-1. AC Electrical Power Available in LSSF

Room Numbers, Area Designations AC Power (60 Hz)	137, Cage Wash	138, Clean Cage Storage	139, Gnd Cont Lab 2	140, Gnd Cont Lab 1	145, Central Supply	146, Lab 3	147, Lab 4	148, Dark Room	149, X-ray	151, Lab 5	152, Surgery	155, Lab 2	156, Lab 1	163, Office/Receiving	AHRS	209, Tissue Lab	210, Plant Holding (phytotrons)	211, Bonded Storage	213, Computer Room	225N, Plant Lab	Restrooms & Showers	Data Control Room*	Office Areas
120V, 15 or 20A, 1 ϕ , 2P, 3 W	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
120/208V, 20A, 3 ϕ , 4P, 5W			X	X																		X	
250V, 30A, 2P, 3W (Locking)				X		X	X			X		X							X			X	
120V, 30A, 2P, 3W (Locking)			X	X		X	X			X		X										X	
250V, 60A, 2P, 3W (Grounded, for mobile x-ray)											X												
120/240V, 20A, 4W																				X		X	
120V, 20A, 2P, 3W (Twistlock grounding jacks)											X												

* Specific power must be requested by PI/ED

4.4 EMERGENCY POWER

Emergency power is provided by a diesel-fueled, 480-V, 3-phase emergency generator (rated at 150 kVA) located outside on the north side. An automatic transfer switch will start the engine and transfer the emergency loads to the generator. This power will serve the portion of the electrical system involved with safety, animal and plant holding, synchronous ground control, surgery, refrigerators and freezers, the data control room, and certain types of laboratory activity. The 1000-gal (3785-l), fiberglass, diesel-fuel tank supporting this generator and the incinerator is located underground on the north side of the building. The engine and generator are provided with a weather enclosure and stand on a concrete pad located some 12 ft (4.2 m) from the main building. The exhaust is discharged away from all air intakes on the main building.

4.5 LIGHTING

Mercury vapor lighting is provided in the high bay and incandescent lighting in the toilets and stairways. Illumination of first floor lab areas, both clean and contaminated, is provided by recessed or lay-in type fluorescent fixtures. Lighting levels for certain areas are as follows:

a. AHRs	100/50 fc (1076/538 lm/m^2)
b. Plant lab	70 fc (753 lm/m^2)
c. Data control room	100 fc (1076 lm/m^2)
d. General corridors	20 fc (215 lm/m^2)
e. Service and machine rooms	20 fc (215 lm/m^2)
f. Phytotrons	Up to 5000 fc (53800 lm/m^2)
g. Laboratories (general purpose and ground control)	100 fc (1076 lm/m^2)
h. Surgery/necropsy	150 fc (1614 lm/m^2)
i. Central supply	70 fc (753 lm/m^2)
j. Cage wash and storage	50 fc (538 lm/m^2)
k. Clean corridors	30 fc (322 lm/m^2)
l. Offices	70 fc (753 lm/m^2)

The lighting in each AHR is controllable by an adjustable 24-h time switch to 50 fc (538 lm/m^2) with a manual override incorporating a run-down timer (maximum 15 min duration). This allows simulation of independent day/night cycles, with temporary interruption possible (15 min maximum). The timers and override switches are installed in secured enclosures outside the rooms in the clean corridor to prevent unauthorized operation. 100 fc is available for room cleanup and inspection. Spectral analysis is available upon request.

Light switches for surgery (room 152) are located outside the room so that regular grounded system power can be used for the lighting. A single head adjustable Castle surgical light fixture is installed in room 152 in addition to the recessed fluorescent fixtures. A controllable dimmer is provided in the x-ray room (149).

Emergency, battery-operated lighting is available in the LSSF. Grey cabinets with two sealed beam lamps rated for 25 W each are located throughout the facility. All lights in the laboratories and the plant area are part of the emergency power system discussed in 4.4.

SECTION V COMMUNICATIONS AND DATA HANDLING

5.1 COMMUNICATIONS

The entire facility is serviced by administrative and operational communications systems. These systems include administrative telephones, a public address (PA) system, range timing indicators, operational intercommunications systems, and operational television (OTV). Locations of communications end items may be arranged through the LSSM and the LSSF Manager.

5.1.1 ADMINISTRATIVE TELEPHONES. This system provides standard commercial end instruments in each room of the LSSF. In the laboratories, data control room, phytotrons, corridors, and biospecimen support areas, the phones are wall-mounted approximately 4 ft (1.2 m) above the floor. End instruments are desk top models in the office/receiving area and the south side office/conference areas.

5.1.2 PA SYSTEM. There is a facility PA system for internal facility paging. This system is part of the CCAFS Paging and Area Warning System with an aural warning device.

5.1.3 RANGE TIMING. Interrange Instrumentation Group (IRIG) - B timing indicators will be provided in the conference room (110) and in the data control room.

5.1.4 INTERCOMMUNICATIONS SYSTEMS. The voice communications on CCAFS use the Transistorized Operations Paging System (TOPS); on KSC, the Operational Intercommunications System (OIS) is used. When necessary, these two systems can be connected to permit voice communications between the two areas. TOPS is a 20-channel system with certain channels reserved primarily for payload operations. The OIS is a multi-channel communications system used to provide communication throughout the KSC Industrial and Launch Complex 39 areas; certain OIS channels will also be reserved primarily for payload operations.

5.1.5 OTV. OTV will be available in 1984 in the LSSF. Number and locations of monitoring units are TBD.

5.2 DATA HANDLING

The LSSF provides no data transmission systems. Any data transmission equipment must be payload provided. The LSSF does supply a system of 6-in wide by 3-in deep (15.2-cm by 7.6-cm) cable trays for carrying the payload-provided data lines. The cable trays run from the data control room to the AHRs and the laboratories (except room 156), where one outlet is provided that is tied to the data control room. Remote monitoring of on-orbit experiment data and of ARC data is achieved through modems tying ARC and the Lyndon B. Johnson Space Center (JSC) Payload Operations Control Center (POCC) to the KSC LSSF. O&C Building user room data monitoring is also available through a modem in the LSSF data control room.

SECTION VI FACILITY DESCRIPTION SUMMARY

6.1 FLOOR SPACE

- a. Storage & Mockup Areas: 7360 ft² (683.7 m²) gross or 46 ft x 160 ft (14.0 m x 48.7 m) & 23 ft 8 in x 16 ft 3 in (7.2 m x 4.9 m)
- b. Cage Wash & Clean Cage Storage Areas: 909 ft² (84.5 m²) gross
- c. Laboratory Area (7 laboratories, 1 central supply, surgery/x-ray/storage areas, & office/receiving): 6018 ft² (559 m²) gross or 59 ft x 102 ft (17.9 m x 31.1 m)
- d. Animal Holding Rooms (AHRs): 7 on 1st floor, 153 ft² (14.2 m²) each room
- e. Growth Chamber Lab: 2nd floor, 562.9 ft² (52.3 m²)
- f. Data Control Room (First floor): 26 ft 2 in x 15 ft 2 in (7.9 m x 4.6 m)
- g. Office Area (South structure): Floors 1 & 2, 3198 ft² (297.1 m²)

6.2 CLEAR VERTICAL HEIGHT

- a. Storage & Mockup Areas: 22 ft (6.7 m)
- b. Laboratory & Cage Wash Areas: 8 ft 6 in (2.6 m) & 9 ft (2.7 m)

6.3 EQUIPMENT ENTRY

- a. Central High Bay (Inclusive of receiving, storage, & mockup storage areas): 129 ft x 27 ft (39.3 m x 8.2 m)

b. Laboratories:	3 ft 6 in x 7 ft (1.1 m x 2.1 m)
c. AHRs	3 ft 6 in x 7 ft (1.1 m x 2.1 m)
d. Central Supply:	3 ft 6 in x 7 ft (1.1 m x 2.1 m)
e. Surgery & X-Ray:	5 ft x 7 ft (1.5 m x 2.1 m) double doors
f. Growth Chamber Lab:	5 ft x 7 ft (1.5 m x 2.1 m) double doors
g. Bonded Storage:	5 ft x 7 ft (1.5 m x 2.1 m) double doors
h. Cage Wash Area:	6 ft x 7 ft (1.8 m x 2.1 m) double doors
i. Data Control Room:	8 ft x 9 ft (2.4 m x 2.7 m) double doors

6.4 CRANES/HOISTS

Central High Bay
(Over storage, mockup,
& receiving areas):

Two 25-ton (22.7-metric ton) bridge cranes

6.5 HOOK HEIGHT

Central High Bay

24 ft (7.3 m)

6.6 SYSTEMS/EQUIPMENT

a. Pneumatics:	6 ft ³ /min (0.2 m ³ /min) compressed air at 100 lb/in ² gage (6.9 bars), vacuum in labs
b. Fluids/Gases:	Hot & cold potable water, DI water in labs; N ₂ , O ₂ , propane (LPG), CO ₂ on portable carts or bottles
c. Cage Washer:	For primate cages: cold & 180°F (82°C) water & portable steam cleaning capability
d. Autoclaves (4)	One 30-ft ³ (0.8-m ³) in Cage Wash; one 18-ft ³ (0.5-m ³) in Central Supply; two 6-ft ³ (0.2-m ³), one each in rms 152 & 225N, temp - 121° to 135°C
e. Environmental Chambers (5):	4 ft x 8 ft x 9 ft (1.2 m x 2.4 m x 2.7 m) each for 4; 6 ft 5 in x 9 ft 7 in x 8 ft 3 in (1.9 m x 2.9 m x 2.5 m) for one
f. Incinerator:	Diesel-fueled; rated for 75 yd ³ (57.3 m ³), 65/50 lb/h (29.5/22.7 kg/h), 85% water content
g. Emergency Generator:	Diesel-fueled, 480-V ac, 3-phase rated at 187 kVA (or 150 kW/0.8 power factor)

- h. Fire Protection Equipment: Fire hoses, sensors, alarms, fire extinguishers
- i. Refrigerators: One explosionproof for volatiles, two for blood/clinical sample storage, 4 to 6 undercounter units; two for animal food storage, 0° to 55°C±0.5°C
- j. Freezers: Two to -80°C max; two to -35°C max

6.7 TEMPERATURE/RELATIVE HUMIDITY

- a. General Areas, Labs, Offices, Plant Expt Areas, Data Control Room: 72±2°F (22.2±1°C)/40% to 60%
- b. AHRs: 70° to 78°F (21.1° to 25.6°C)/40% to 60%

6.8 ELECTRICAL POWER

- a. All Areas: 120 V ac, 15 or 20 A, 1 phase, 60 Hz
- b. Ground Control Labs 1 & 2, Data Cont. Rm: 120/208-V ac, 300-kVA, 3-phase, 60-Hz instrument quality power & grounding
- c. Plant Lab (225) & Data Cont. Rm: 120/240-V ac, 3-phase, 60-Hz instrument quality power & grounding
- d. Labs 2, 3, 4, 5; Tissue Lab; Gnd Cont. Lab 1; Computer Rm; Data Cont. Rm: 250 V ac, 30 A, 60 Hz
- e. Surgery (for mobile x-ray): 250 V ac, 60 A, 60 Hz
- f. Data Cont. Rm: 480-V ac input power, 750-kVA, 3-phase, 60-Hz instrument quality power & grounding

NOTE: Emergency power to critical areas

6.9 ILLUMINATION

- a. Labs, Data Cont.
Rm, Computer Rm: 100 fc (1076 lm/m²)
- b. AHRs: 100/50 fc (1076/538 lm/m²)
- c. Plant Lab,
Offices, Central
Supply: 70 fc (753 lm/m²)
- d. Surgery/Necropsy: 150 fc (1614 lm/m²)
- e. Phytotrons: Up to 5000 fc (53800 lm/m²)
- f. Other Areas: 20 to 50 fc (215 to 538 lm/m²)

6.10 COMMUNICATIONS AND DATA HANDLING

- a. All Areas Administrative telephones & PA
- b. Animal & Plant
Expt Support
Areas: OIS/TOPS within LSSF & between LSSF/KSC
Industrial Area/Launch Pad
- c. Conference Rm
& Data Cont. Rm: IRIG-B timing
- d. AHRs, Labs, Data
Cont. Rm Outlet for tying into Data Cont. Rm
(Cables are expt provided); modem
communication with JSC POCC & ARC

6.11 SAFETY

- a. Automatic/manual fire detection/protection
- b. Emergency eyewashes/safety showers
- c. Not an explosive safe area

APPENDIX A
LSSF GENERAL EQUIPMENT

Table A-1. General LSSF Movable Equipment

Equipment	Quantity	Remarks
Biospecimen Transport Van (BTV)	1	See appendix B
Freezers - 80°C Max - 35°C Max	2 2	Revco ULT 1685B, 16 ft ³ (0.5 m ³) Revco ULT 2235A, 21 ft ³ (0.6 m ³)
Refrigerators	1 2 3	Explosion proofed to contain any volatiles. Lab Line 3559-10 Use for blood storage, clinical samples, etc. Lab Line 3554-25 Undercounter units 6.5 ft ³ (0.2 m ³), CMS 972-521
Environmental box for animal food storage	2	14.6 ft ³ (0.4 m ³), temp range 0° to 55°C ± 0.5°C; Lab Line 3554-25
Ice machine	1	High capacity, Kings-Seely Thermos Co., Alberthea, Minn. - Model HC-800SAE-9A
Dry ice storage chest	1	Thermo Safe CMS 024-802
Water distilling unit	1	Barnstead A1050 glass lined, 4 l/h; comparable units available from Corning; should be glass lined

Table A-1. General LSSF Movable Equipment (Continued)

Equipment	Quantity	Remarks
Wet/dry vacuum	2	Stainless steel non-corrosive container Advance Co., J12005. Attachments include: tip dispose dolly, hose, wand, squeegee tool, gulp tool.
Waste cans Animal rooms	1 per room (5)	GSA 5 gal (18.9 l) 7240-00-160-0443 + lid 7240-00-161-1152
Animal clean-up area	5	GSA 32 gal (121.1 l) 7240-00-160-0440 + lid 7240-00-161-1143
Laboratories	2 per bio-area	GSA-like for offices, with plastic liners; separate radioactive waste containers will be provided by contractor monitoring radioactives.
Waste can dolly	2 Animal area only (3) 1-2	To be used as waste dolly To be used for supplies (2-3) platform dolly truck, 24 in x 42 in (60.9 cm x 101.6 cm), Cole Palmer 969-30 Same as above for handling & moving GSE from high bay to labs
Ship/receiving	Composite supplies	GSA available: boxes, paper, styrofoam worms, string, banding, bander, mailing cartons
X-ray unit	1	To be transferred to KSC from ARC when needed
X-ray film		High-speed Kodak (double width)
Lead gloves	2	
Lead apron	1	
X-ray processor	1	F-140 Filmatic Processor
Portable dehumidifier	7	1/AHR

Table A-1. General LSSF Movable Equipment (Continued)

Equipment	Quantity	Remarks
Lab carts	1	For transport of standard 1A cylinder; Matheson #503 hand truck
Gas cylinder	1	For transport of liquid N ₂ cylinder; Harper truck, Linde Cryogenics
Glassware & animal bottle	4-6	Labconco 80325
Laboratory	4-6	Labconco 80475 or Labconco 80200
Instrument cart	2	Labconco 80525
Lab jacks	2	CMS 335-273 3 in x 3 in (7.6 cm x 7.6 cm)
Small		
Medium		CMS 335-281 6 in x 7 in (15.2 cm x 17.8 cm)
Equipment racks	3-4	19 in (48.3), probably available through Center distribution
Storage cabinets	6-10	GSA 7215-00-269-8534, available through Center distribution
Steel shelving	4	For use in shop area - Arrow BC 4800C - 12 in (30.5 cm) deep
Transport dollies	1	See appendix B
Van to pad		
Lab carts		Explained previously
Lab stools	2-3/lab	GSA 7110-00-194-1611 leatherette swivel with back, GSA 7110-00-634-8596, metal without back
Hygrothermograph	7	Unit with 7-day temp/humidity sensor & recording on same chart; i.e., Friez with bourbon tube or Serdex Bachrach animal membrane type; range sensitivity 0-100% RH & 100°F (37.8°C)

Table A-1. General LSSF Movable Equipment (Continued)

Equipment	Quantity	Remarks
Chairs	2/lab	GSA 7110-00-273-8785 straight back leatherette, non-swivel-Center furniture
Safety step ladder	2	Cole-Parmer 9306-00, 3-step narrow with handrails
KIK step	4	Cole-Parmer 9252-000
Sonic cleaner for glassware	1	Branson Ser. B52, CMS 285-072
Cleaning solution	1 case	1 case: 12 quart bottles micro-cleaning solution
Vu-graph machine & screen	1	
Conference table	1	In office area, Center distribution
Tables, desks, chairs		Assume 30 desks, 10 tables, 60 chairs needed in office area. Note: 1 desk, table, 3 chairs, bookcase in Lab-Animal Receiving Office
Portable lamps		Need 3-4 for laboratory areas; obtained through GSA
Liquid nitrogen dewars	2	Narrow storage unit, CMS 099-077
	2	1-qt (0.9-1) wide mouth incubation CMS 354-704
	2	4-qt (3.8-1) wide mouth incubation CMS 099-127
	2	8-qt (7.6-1) wide mouth incubation CMS 099-135
Copy machine	1	Generally controlled by Center distribution
Rapifax terminal	1	Controlled through MSFC
Telex terminal	1	Must be rented; HQ approval required

Table A-2. Small Mammal and Amphibian Handling Equipment

Equipment	Quantity	Remarks
Rodent cage racks, laminar flow animal cages	14 (15 cages/rack)	Stay Clean System Lab Products 30460, dependent on RAHF simulator design
Rat cage system	10 per case (30 cases to provide 300 cages)	Lab Products, Inc., Micro Isolator System 10409 includes: 18727 - cage 10428 - lid 18704 - frame 18705 - bonnet
Waterers	300	Lab Products, Inc. 30160 - water bottle 30008 - #8 rubber stopper 30135 - SS sipper tube
Squirrel monkey cages	24 (4 racks with 6 cages ea)	Hazeltan Systems, N2-1830-6
Sipper tubes	24	Lithgrow Services, Inc.
Animal restraining gear		
Monkey net		
Food storage		Low temp. chest (15°C). This may be freezer dependent on final flight type food selection.

Table A-3. Laboratory Equipment for LSSF

Equipment	Quantity	Remarks
Thermometers	5-8	General lab with temp ranges -100°C to 50°C -20°C to 150°C -5°C to 50°C YSI multiprobe or Caspar digital; ARC supplied
Hot plates & stirrers	7	Corning 6795-351, ceramic top stirrer/hot plate combination
Stir bars	12 ea size	Std oblong 7 mm; 1.5 in (3.8cm), 3 in (7.6 cm), & 5/8 in (1.6 cm) O.D.
Vortex tube mixer	1	CMS 205-419 Vortex Genie, single standard tube, variable speed
Vortex micro-mixer	1	Lab line 1298 for smaller tubes
Examining devices		Veterinary staff supplies, Am. Hospital Supplies, Miami, Fl. (Stethoscope to treatment cart)
Stethoscope	2	Cat. no. 30748-XXX, Bard Parker Dua Sonic; 1 unit for veterinarian, 1 unit for surgical area
	3	Cat. no. 30710-010, Tomac Bowles, 2 for vet. asst, 1 for "crash cart" or emergency bag
	1 cs	Disposable esophageal - 20/cs; used to monitor respiration & heart beat through intubation of esophagus; use in surgical area
Electronic thermometer	1	Cat. no. 14550, Temp Stat, mercury battery powered
	2 dz	Cat. no. 14612-012, Rectal Red Tri-Top, dual scale, reg seal
Ophthalmoscope & otoscope with rechargeable base	1 set	Cat. no. 31434-010, Welch Allyn 99500 Complete, 3.5 vs Halogen Diagnostic Set

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Laryngoscope	2	Cat. no. 31483-010, medium hook-on handle & size C dry batteries
Blades	1	Cat. no. 31460-010, size 1, length 87 mm
	1	Cat. no. 31460-020, size 2, length 108 mm
	1	Cat. no. 31460-040, size 3, length 127 mm
	1	Cat. no. 31460-040, size 4, length 159 mm
Liquid scintillation counter	1	TBD by expt. selection; when selected, unit should incorporate gamma and tritium counting
Treatment cart	1	A-Line Cart by III Hamilton Industries, Two Rivers, WI 54241
Microscope	1	American Optical, Scientific Instrument Division, Buffalo, Ny 14215, V120TG FD5
Anaesthesia apparatus		Metomatic 980, 2-gas system (nitrous oxide, oxygen, methoxy-flurane) Pittman-Moore, Washington Crossing, NJ
Euthanasia chamber	2-3	Use rodent cage with plexiglass top with attached tubing; attach to cage top & to gas bottle regulator (CO ₂). Tops may be fabricated for variable size cages.
Bottled gases	1 ea	Oxygen, nitric oxide, carbon dioxide
Regulators	1/btl	Fisher Scientific Co., Orlando FL 32809

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Incubator 45° & 37° Bacteriological/embedding	1	Multiple functions - CMS 020-669, Lab Line 610 - 38 in x 18 in x 26 in (96.5 cm x 45.7 cm x 66.0 cm); temp range ambient to 55°C
Multipurpose dry heat or wet with or without CO ₂	1	NAPCO 5300 double chambers that may be controlled independently, each chamber 19 in x 18 in x 27 in (48.3 cm x 45.7 cm x 68.6 cm) CMS 025-510; temp range ambient to 55°C
Centrifuge: Micro-hematocrit	1	Micro-Hematocrit, MHCT II, Clay Adams 0556
Micro-centrifuge	1	Brinkman Model 5412, Brinkman 22 36 240-2
Refrigerated - high speed	1	Sorval Superspeed RC-2B 1°C to ambient, speeds to 20,000 rev/min; include heads for 10-cc tube to 50-cc tube & guards. Further heads & appropriate tubes TBD by expt. selection
General purpose	1	IEC 2355, HN-SII
Balances: Rodent weights	2	One model DS-1 K-Tron Digital Balance, 0.1 g resolution; one Mettler PK-4800
Tissue weights	2	Model 5721 Cahn Electrobalance (Micro Balance) CMS 385-864; 0.1 micro-g to 0.1 mg resolution
Chemical, reagent weights	1	Mettler Electronic analytical balance HL-32, 1 mg resolution, weight range 0-160 g
Mechanical, analytical	1	Mechanical, analytical, accuracy, NBS class S, ± 0.1 mg; CMS 353-920, Ainsworth Model Beta N-IV
Chemical analysis equipment	---	TBD by expt selection
Animal exam/surgery table	1	Shore-Line hydraulic lift
Handling instruments	---	TBD by expt selection
Surgery/necropsy equipment	---	Covered under veterinary equipment

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Rat guillotine	3	EDCO #7575, EDCO Scientific, Sherborne, MD
Urine collection station	---	Expt specific
Specimen preparation equipment	---	Expt specific
Vacuum oven, embedding apparatus, microtomes, & cryostat	---	All imply issue sectioning; TBD by expt selection
Microscopes: light w/camera		Expt specific, TBD
Phase (UV & dark field)	1	Olympus BH2, research model, with OM-2 camera
Fluorescent	1	Olympus BH2, fluorescent model
Dissecting	2	General purpose stereo zoom, capable of accepting camera; B&L 31-26-30-07 with Polaroid camera
Below stage working		TBD by expt selection
Straining apparatus: Stains		TBD by expt needs
Slide staining rack	1	Clay Adams 3832
Slides	1 gross	Fisher frosted 3 in (7.6 cm); numbers determined by expt selection, Fisher 12-550-34
Wanning trays	1	Fisher 12-594
Ocular micrometers		Items are part of eventually procured scopes
Organic vapor meter	1	Analytical Instrument Development Co., Model 910 to monitor ETO concentrations

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Clamps	5 ea type	It is difficult to predict the numbers that will be needed; the following suggested types cover a spectrum:
Medium buret		CMS 383-299, vinylized jaw grips, to 2-1/4 in (5.7 cm)
Small buret		CMS 058-966, vinylized jaw grips, to 1-1/2 in (3.8 cm)
Medium 3 finger		CMS 058-982, vinylized jaw grips, to 2-1/4 in (5.7 cm)
Clamp extension, round jaw		CMS 058-461
Clamp, tri-grip, large extension		CMS 058-636
Hoffman screw compressor		CMS 059-162, package of 12
Clamp hosecock		CMS 059-188
Clamp, pinchcock, all-purpose		CMS 059-246
Clamp, Day's pinchcock		CMS 059-394, package of 12
Clamp, Mohr pinchcock, flat		CMS 059-386, 5/8-in (1.6-cm) tubing, 3-1/2 in (8.9 cm) long, package of 12
Clamp, worm		Kits available to cut to desired size from long tubing
Clamp, Stoddard		CMS 059-105, package of 12
Clamp holder, rigid		CMS 058-800
Supports, triangular	3	CMS 220-210, 4 in (10.2 cm), black enamel
	3	CMS 220-236, 6-1/2 in (16.5 cm), black enamel

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Flasks - Erlenmeyer, narrow mouth, Kimax with capacity scale:		
25 ml	5/lab	CMS 097-451, 12 per package
50 ml	5/lab	CMS 097-469
125 ml	5/lab	CMS 097-477
250 ml	5/lab	CMS 097-433
500 ml	3/lab	CMS 097-519
1000 ml	3/lab	CMS 097-535
		Specific volumetric flasks or glass stoppered flasks TBD by experiment selection
Tapes, rulers, calipers		
Titration glassware		Analytical & TBD by experiment selection
Trays - stainless steel	5	CMS 233-304, SS with cover, 12-1/8 x 7-5/8 x 2-1/8
	5	CMS 233-320, SS with cover, 8-7/8 x 5 x 2
	5	CMS 233-361, SS 5-quart capacity, 16-5/8 x 9-3/4 x 2-1/2
	5	CMS 282-954, SS shallow, 19 x 12-1/2 x 5/8
pH meters		
pH meter electrodes:	3	Corning Digital 112
Reference	5 of ea	Need for further specific electrodes may exist TBD by experiment selection
Glass		
Small sample		
Combination		

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Volumetric containers:	5/lab	CMS 075-853, 50-ml graduated cylinders, 0.1-ml div, 12 per package
	5/lab	CMS 075-879, 100-ml graduated cylinders, 1.0-ml div, 12 per package
	2/lab	CMS 075-754, 250-ml graduated cylinders, 2.0-ml div, 6 per case
Beakers - Griffin, low form, graduated:		
10 ml	5/lab	CMS 029-488, (Kimax or Pyrex, 12 per package)
30 ml	5/lab	CMS 029-512
50 ml	5/lab	CMS 029-520
100 ml	5/lab	CMS 029-538
250 ml	5/lab	CMS 029-553
500 ml	3/lab	CMS 029-579
1000 ml	3/lab	CMS 029-595
2000 ml	2/lab	CMS 029-611
Liquid dilution/dispenser	1	TBD by experiment selection
Bunsen burners & stands:	5	CMS 055-566, Fisher Burner
	5	CMS 043-216, Tirrill Burner
	2 pkgs	CMS 043-349, 7/8 in (2.2 cm), 10 per package
	5	CMS 043-356, 1/2 in (1.3 cm), 10 per package
		CMS 233-783, 8-in (20.3-cm) concentric ringed tripods

Table A-3. Laboratory Equipment for LSSF (Continued)

Equipment	Quantity	Remarks
Stage micrometers		Part of eventually procured scopes
Spectrophotometer Clinical & analytical	1	Large UV/Vis Beckman 30 series
Chemical	1	B&L Spec 70, small
Gas chromatograph	1	Hewlett Packard, HP 5880A
Other expt-selection dependent equipment: Refractometer Plethysmograph Photospectrometer Ophthalmological apparatus Proctosigmoidoscope Dynamometer Bone densitometer Chromatographic equipment Electrophoresis equipment Autoradiographic equipment Culture revolving racks Shaker (flask) Lyophilizer		TBD
Film badges	---	Sufficient number of personnel present during mission including visitors; to be provided by radiation monitoring contractor

Table A-4. Expendable/Disposable Equipment

Equipment	Quantity	Remarks
Aluminum foil	4 boxes	GSA 8135-00-724-0051, 0.0010 in (0.025 mm) thick, 457 x 18
Parafilm	1 case	CMS 185-959, 4 in x 125 ft (10.2 cm x 38.1 m), 12 boxes per case
	1 case	CMS 382-598, 4 in x 250 ft (10.2 cm x 38.1 m), 12 boxes per case
Marking pens	2 pkgs	CMS 381-459, fine-line, china & paper markers, 12 per package
Towels:		
Kimwipes	1 case	GSA 7920-00-721-8884, 5 x 8-1/2
Masslin	1 case	GSA 7920-00-901-9014
Weighing:		
Boats	1 pkg (500)	CMS 251-553, micro, 1-5/8 sq CMS 251-561, regular, 3-3/16 sq CMS 251-579, super, 5-1/2 sq
Paper for analytical	1 pkg (500)	CMS 340-919, 3 x 3 CMS 340-927, 6 x 6
Lens paper	1 pkg	CMS 268-425, 50 sheets, 1 package = 12 books; 100% lint free, cleaning optical instruments, objects, lenses
Boots, disposable	100/box 5 boxes	Fisher 2-740A, medium
	5 boxes	Fisher 2-740D, large, extra heavy

Table A-4. Expendable/Disposable Equipment (Continued)

Equipment	Quantity	Remarks
Masks, disposable	20 boxes	3M Co., GSA 6510-00-982-7493
Gloves:		
Laboratory, plastic, disposable	10 pkgs	GSA 6515-00-779-9434, small, clear, fits either hand
	20 pkgs	GSA 6515-00-880-4347, medium, clear, fits either hand
	20 pkgs	GSA 6515-00-841-7871, large, clear, fits either hand
Bags, polyethylene:		
Rectangular	1000 ea	GSA 8105-00-655-8286, 38 in x 19 in (96.5 cm x 48.3 cm) used as waste can liners
Ziplock types	20 ea	GSA 8105-00-401-2010, 16 in x 12 in (40.6 cm x 30.5 cm)
	20 ea (Fac. maintenance nos.)	GSA 8105-00-837-7753, 4 in x 4 in (10.2 cm x 10.2 cm)
Brushes: surgical scrub	2 pkgs	3M Co., 1875N, 20 per package
Scrub brushes:		
Beaker	1 dz	CMS 049-79, white nylon bristle on wood handle, 2-3/8-in (6.1-cm) taper to 2-3/4 in (6.9 cm), 16 in (40.1 cm) total length
Test tube	1 dz	CMS 040-030, 4 in x 1-3/8 in (10.2 cm x 3.5 cm) diameter, 10-1/2 in (26.7 cm) total length
Ice buckets	6	CMS 146-944, foam, PVC

Table A-4. Expendable/Disposable Equipment (Continued)

Equipment	Quantity	Remarks
Disposable pipettes:		
Serological, cotton plug sterile	1 case	CMS 352-013, 0.5 ml
	1 case	CMS 391-995, 1.0 ml
	1 case	CMS 392-019, 5.0 ml
	1 case	CMS 392-0217, 10 ml
	(500/case)	Numbers may increase dependent on experiment selection
Blook work pipettes	TBD	TBD by experiment selection
Dropping pipettes	10-20 ea	80 to 145 mm sizes
Eppendorf pipettes - multiple volume	2 sets	CMS 382-234, 10/20/25 microliters
	2 sets	CMS 382-259, 50/75/100 microliters
		Number of sets subject to experiment selection
Pipette tips	6 pkgs	1000 tips per package
Rubber bulb for pipetting	4 ea	CMS 269-654
Cleaning compound, washing detergent		As determined by cage washer manufacturer & glassware washer manufacturer
Radioactive decontaminant	4L	Liquid concentrate - Count Off, New England Nuclear, NEF 942
	6 cans	NEF 942-B, foam hand cleaner, New England Nuclear
Test tubes, vials, syringes	TBD	Tubes: 13 x 57 mm, Wheaton 225402, CMS 026-856

APPENDIX B
BIOSPECIMEN TRANSPORT VAN

B.1 GENERAL

The Biospecimen Transport Van (BTV) is a commercially available vehicle that is being modified to transport biospecimens, flight hardware, and support ground support equipment (GSE) to and from various locations including the Life Science Support Facility (LSSF), launch pad, and commercial air terminals. The van will be capable of transporting up to 3500 lb (1587.6 kg) of payload. See figure B-1. The BTV will be available by the end of 1983.

B.2 CARGO AREA

The BTV interior measures 15-1/2 ft long, 7-1/2 ft wide, and 7 ft high (4.7 m by 2.3 m by 2.1 m). The interior is fully lined with seamless waterproof 6061 aluminum or stainless steel on the floor, sides, and ceiling to permit detergent washdown. The exterior of the BTV is also waterproof. The BTV is insulated with a closed-cell material.

Floor loading can maintain 200 lb/ft² (976.4 kg/m²) and a total of 4000 lb (1814.4 kg) on the van bed.

There are two out-swinging doors mounted in the rear. They are 3 ft by 7 ft (0.9 m by 2.1 m) with 100 in² (254 cm²) of safety plate fixed windows. The windows are equipped with adjustable blackout shutters in each door panel. Doors can be locked.

There are tie-down attachments on the interior wall surfaces spaced at 18-in (45.7-cm) intervals at 3-ft and 5-ft (0.9-m and 1.5-m) heights above the floor. There is fold-down seating for four persons maximum.

There is a rear tail gate lift 72 in by 42 in (182.9 cm by 106.7 cm) for roll-on loading. The tail gate lift is 12-V dc powered, electromechanical, with 1500-lb (680.4-kg) minimum capacity. The lift is controllable from either side of the vehicle.

There are two waterproof, incandescent, flush-mounted, 50-W ceiling light fixtures inside the cargo area. There is a see-through window between the cab and the cargo area. Light can be blocked through this window if necessary. Two 120-V, 20-A, 60-Hz receptacles are inside the cargo box.

Two-way communication is provided between the cab and the cargo box and from the van to the launch pad and the LSSF. OIS/TOPS will be the system used.

B.3 CAB

The cab is shock-mounted, air-conditioned, and heated; it has a 4-way single adjustable driver's seat, bench seat for 2 passengers, and instrumentation and controls for cargo conditioning system and auxillary generator.

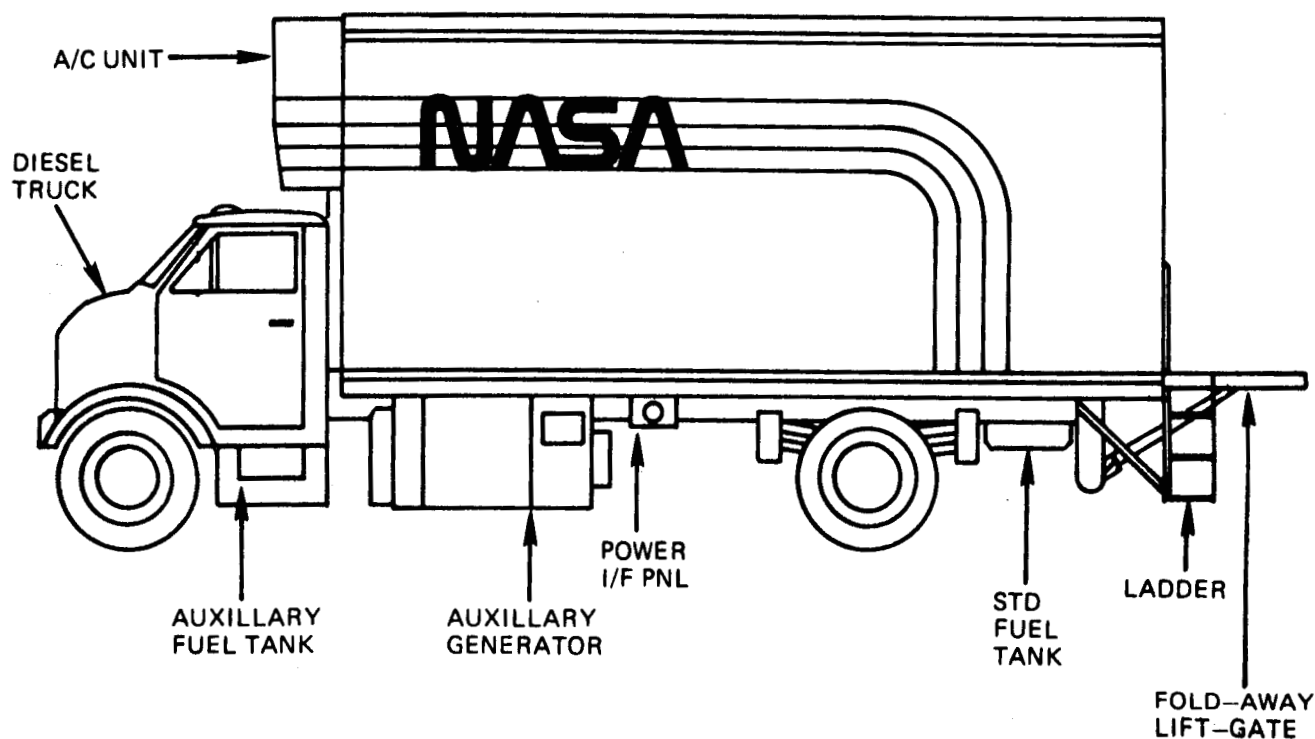


Figure B-1. Biospecimen Transport Van

The diesel engine is 4 cylinder, in-line vertical stroke, 4 cycle, air-cooled with overhead valve, and rated at 1800 rev/min. The remote-start voltage-regulated generator is 15 kW, 120/208 V ac, 43.5 A, 60 Hz, 3 phase, 4 wire with ground (1800 rev/min). A 12-V negative ground, 515 cold-cranking ampere battery and an 80-A alternator with integral regulator to develop 42-A output at 700 engine rev/min are provided.

There are two exterior 120-V, 20-A, 60-Hz receptacles, and the van has a power receptacle near the engine generator set to use facility power by means of a 50-ft (15.2-m) power cord that travels with the BTV and is stored in the vehicle utilities compartment.

B.4 ENVIRONMENTAL CONTROL

The van has its own 3-ton air-conditioning unit that is self-contained and electrically powered. The supply blower provides 1400 ft³/min (39.6 m³/min) at 5.0 in of water (9.3 mm of mercury) static pressure. Return air passes through a register and louvered damper 3 in (7.6 cm) above the floor on the front wall. The unit has a 5-kW backup strip heater. There are three levels of filters: the first level is a dust filter (high capacity, bag type); the second is an activated carbon adsorptive type; and the third is a HEPA filter, 99.97% efficient for removing particles of 0.5 micron and larger. System control of the heating and cooling is by a solid state controller in the cab.



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